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## *This Month's Cover*

*There is perhaps no introduced horticultural subject that has appreciated more New Zealand's cool temperate climate with its generally ample and evenly spread rainfall than the rhododendron in its wide range of colours, forms, and periods of blooming. The variety Alice on this month's cover is thriving typically in the bush setting of an informal North Island garden. In spite of its characteristic mummified stolidity the spiny stick insect* (Acanthoderus horridus), *with a similarly wide variety of size and colouring, appears to have an eye for beauty. Coloured photograph by Perry Photographer.*

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16 NOV 1954

# Research Work of Extension Division

**TO provide farmers with information on local problems of soil management, crop and pasture production, and farm management the Extension Division of the Department of Agriculture carries out a large programme of experimental and survey work each year. This article, the first of two on the work of the Division, describes the organisation and work of the co-operative field experimental section and the research stations. The second article, describing the seed certification scheme and extension activities of the Division, will appear in the October "Journal".**

THE knowledge which is used by the instructors of the Extension Division must be comprehensive and up to date. It must be accurate. It must be of use to the individual farmer and have application to his particular problems in his particular locality. Such knowledge does not come by chance; it must be carefully obtained by accurate experimental work and must be kept up to date with the changing patterns of soil fertility and farming practice and the rapid advances in agricultural science generally. This makes necessary a large and increasing volume of research work so that instructors may be able to give reliable information to each farmer who seeks advice.

| Nature of experiments | Number of experiments open at 31 March 1954 | | | |
|---|---|---|---|---|
| | Co-operative trials on farms | Marton and other experimental areas | Research stations | Totals |
| Pasture production measurement .. | 38 | 32 | 78 | 148 |
| Observational pasture topdressing .. | 853 | 25 | 36 | 914 |
| Pasture species .. | 203 | 1 | 27 | 231 |
| Annual crops .. | 313 | 17 | 46 | 376 |
| Miscellaneous .. | 329 | 4 | 91 | 424 |
| Totals .. .. | 1,736 | 79 | 278 | 2,093 |

The size of the experimental organisation required to meet this demand may be judged by the fact that the number of experiments now open exceeds 2090, of which more than 1730 are co-operative experiments on farms. Some idea of the types of these investigations is given by the table at left.

## ORGANISATION OF EXPERIMENTAL WORK

The experimental work of the Division can be considered under two main headings—that located on research stations (at Rukuhia, Winchmore, and Invermay) and field trials, mainly co-operative experiments on farms. In the majority of cases the more complex investigations and those requiring much stock manipulation are, of necessity, located at the research stations. These stations do much preliminary testing of new materials and methods before passing on the more promising of these for final testing in field experiments.

Many experiments must be carried out in the areas where problems occur. Most soil fertility investigations are of this nature, for these must be conducted on all the major soil types in the various districts throughout New Zealand. This also applies to many trials with pasture species and annual crops. Testing at one or two research centres has been shown to be insufficient to assess the value of new wheat varieties, for example. It is necessary to go on to the farm where the crop is grown and see how the new varieties behave under field conditions.

HEADING PHOTOGRAPH: The research area at Winchmore Irrigation Research Station. The laboratory buildings are at the right and the main water-race is along the line of trees at the left. Auster Airviews photograph.

The need to take research to the farm has resulted in the scheme of co-operative experiments on farms. These trials form the major part of the research activities of the Division. Such trials were being conducted when the Department of Agriculture was founded, but they were rather haphazard in those early days and were mainly confined to annual crops. Only in the last 25 years has an organised system of field research been built up. This has been possible only because many hundreds of farmers in all parts of New Zealand have always been ready to give assistance in labour and materials. They have often put up with the considerable inconvenience caused by trials on their property. On the other hand they have often got something in return, for very often the results of the experiments have been of invaluable assistance to them. Nevertheless the farming community as a whole has every reason to be grateful to these far-seeing and progressive men who have co-operated with field officers in this field research.

The research stations provide the chemical services for the field research, and the field officer doing the research has the assistance of specialist officers in pasture and crop production and has available all necessary statistical services. All the Division's experimental work, whether in the field or on research stations, is co-ordinated through the Field Crop Experimentalist. This officer is responsible for the planning, design, and statistical analysis of all trials. No small part of his duties is the keeping of experimental records and the preparation of summaries of results of research for field officers or for publication. Liaison is maintained with various Divisions of the Department of Scientific and Industrial Research and with other related scientific bodies such as the Soil Conservation and Rivers Control Council. The Department of Scientific and Industrial Research works in close co-operation with the Department of Agriculture and the field testing of newly bred or introduced pasture and crop strains and varieties is the responsibility of the experimental services of the Extension Division.

Mowing pasture plots at the Marton Experimental Area.

Improvements in the design and statistical analysis of experiments have been an important advance in field experimentation. It is now possible to assess the value of the results of individual experiments with considerable accuracy, and published data may now be accepted with confidence. The statistical staff of the Field Crop Experimentalist also analyses the results of fields surveys of various types which are becoming an increasingly important part of the research programme.

District officers of the Extension Division are required to devote a considerable proportion of their time to this experimental work, and this must necessarily reduce the time they can spend on extension work, even though the demand for their advisory services is greater than the staff can handle.

Below—Testing at one or two research centres has been shown to be insufficient to assess the value of new wheat varieties. It is necessary to go on to the farms and see how the new varieties behave under field conditions in various districts.

The need to take research to the farms has resulted in the scheme of co-operative experiments on farms. Such trials form the major part of the research activities of the Extension Division.

Nevertheless the carrying out of experimental work greatly improves the knowledge and efficiency of extension officers and it would be unwise to separate their experimental and extension activities.

## Scope of Experimental Work

Soil fertility investigations form the major proportion of the research activities of the Extension Division. The determination of the manurial requirements of the many diverse soil types throughout the country requires that many hundreds of topdressing trials incorporating lime, phosphates, potash, nitrogen, and minor elements be carried out. This work must be closely linked with the soil testing service of the Division. Minor element investigations form an increasingly important section of the work and more than 400 topdressing trials incorporating molybdenum applications are now in progress.

Many manurial trials cannot be satisfactorily assessed by observation and this makes necessary the taking of production measurements. Yield measurements are, of course, the normal way of assessing the manurial requirements of crops, but the measurement of pasture production presents special difficulties. New techniques have been devised, however, and the Division is laying down an increasing number of mowing trials on pasture. Comparisons of rates of fertilisers, particularly phosphates, are among the more important investigations that require mowing techniques. Past research has enabled the classification of most soil types into categories such as "phosphate deficient", but the determination of the best rate at which to apply phosphatic fertiliser, and the best form of phosphatic fertiliser requires more exact work. Such work has also to be gauged in relation to pasture type, sward management, and previous history, the last of which includes both cropping history and previous fertiliser and lime applications.

Crop manurial trials need a somewhat different approach. Annual crops differ in their fertiliser requirements and the soil, the crop, the method of fertiliser placement, crop rotation, and previous manurial history all have to be considered and evaluated. Wherever possible the survey method is used to define the problem. Crops are studied individually and experiments are planned with reference to soil type and previous history. The work must be kept up to date. Whereas 20 years ago responses of wheat to 1cwt. per acre of superphosphate were about 4 to 6 bushels per acre, today they usually range between 1 and 3 bushels per acre.

### Pasture Species Trials

Much work has been concentrated on finding pasture species suitable for "problem" country: Droughty land, depleted country, and difficult soil types such as peats. The improvement of hill country pastures is an important activity and many trials investigate the value of various pasture species, times of sowing, management of the area before and after sowing, and fertiliser requirements in the oversowing of such pastures. Much work has been done in past years to investigate the pelleting of clover seed with various materials, mainly fertilisers, in an endeavour to improve establishment and early growth. This has not met with much success, but the investigations are being continued on a more restricted scale.

### Weed Control

The control of weeds in pastures and crops has always been of great importance to New Zealand agriculture. Recent advances in chemical methods of control, particularly by use of the various hormone-type weedkillers, have opened up a wide field of investigation and research, and trials with these materials are being conducted on as extensive a scale as staff and facilities permit. This field is a relatively new one, and as new developments are occurring rapidly, there is a big demand for research which will enable these advances to be applied to farming practice. Developments on the chemical side have been paralleled in some measure by improved mechanical methods of eradicating weeds.

### Annual Crops

Each year a large number of annual crop trials is carried out with wheat, oats, barley, linseed, linen flax, maize, potatoes, lupins, peas, and other crops. Manurial trials have been considered earlier. The field testing of newly bred or introduced crop varieties is made in co-operation with the Crop Research Division of the Department of Scientific and Industrial Research.

### Farm Management

Problems of farm management are investigated by the economics section of the Division, which works in close association with the field crop experimental section and instructors. Data are collected by field surveys and from records kept by co-operating farmers in farm improvement groups to determine such matters as the economics of marginal land development, irrigation, intensive meat and dairy production methods, and costs of production of cash crops. Field surveys are frequently necessary to provide data for the definition of problems and for the co-ordination of the services of specialist officers to plan necessary experimental work. For from the initial sectional approach to problems of soil, crop, pasture, and animal management the final assessment of results must often be made by instructors and farmers in terms of farm management.

## RESEARCH STATIONS

The research stations of the Division are organised to service field experimental and advisory work and to investigate local problems. Their work is confined to spheres essential to the advisory service but not covered by the research stations of the Department of Scientific and Industrial Research. Rukuhia Soil Research Station provides the chemical services required by the Division for advisory and regulatory work, investigates local soil fertility problems, and tests new materials and experimental methods. Winchmore Irrigation Research Station, Ashburton, investigates the problems of irrigating light land in Canterbury and the economics of irrigation farming. Invermay Agricultural Research Station, Taieri, deals with local soil fertility, crop, pasture, and livestock management problems, as well as testing new materials and experimental methods. The Division also maintains the Marton Experimental Area and carries out co-operative trials on the Winton Experimental Area and on the Northern Wairoa, Stratford, and Waimate West Demonstration Farms. All stations work in close liaison with the Division's instructional staff and are used by the latter for organised field day extension work.

### Rukuhia Soil Research Station

The headquarters of the Rukuhia Soil Research Station are situated 4 miles south of Hamilton on the main road to Te Awamutu. The headquarters block is of 60 acres and an additional 30 acres near the

Rukuhia aerodrome is used for field trial work. Peat development work is carried out on leased land. The chemical laboratory of the station is housed in a disused small arms ammunition factory at Hillcrest. The work of the station centres round servicing instructors in soil fertility problems and in testing materials and experimental methods. The chemical section has subdivisions dealing with soil analysis, fertilisers, plant analysis, and chemical research in soil problems. Spectro-chemical equipment and services are well developed and handle much of the analytical work. This section also services the Horticulture Division in its requirements for soil and plant analysis and in a co-ordinated programme of research in plant nutrition aspects of vegetable production. The station also maintains weed control, microbiology, soil physics, and field experimental sections.

**Soil Testing Service**

The soil testing service provided by the Rukuhia Soil Research Station is of considerable assistance to farmers for determining fertiliser and lime treatment of land. Advisory work on soil fertility problems is an important part of an instructor's duty and each instructor has to build up a fund of knowledge about each soil type in his district through observation and experiment. For the treatment of individual fields, however, each with a complicated history of fertiliser treatment and management, soil tests are a valuable help in advisory work. The soil testing service at present operates from two centres, Hamilton and Ashburton, under unified control, but servicing the North and South Islands respectively. At present each laboratory is handling 8000 to 10,000 samples a year. Tests comprise pH (acidity or alkalinity), phosphorus, potassium, and calcium tests, from which the instructor, with a knowledge of the characteristics and responses of soil types, can work out the necessary fertiliser and lime treatment.

To further a more detailed study of crop and pasture nutrition problems both plot and chemical work have been done for several years. Data have been accumulated regarding deficiency symptoms and growth responses and the use of tissue tests and ash analysis in advisory work. As data are accumulated and tested the scope of the soil testing service will be extended.

**Fertilisers and Lime**

The Hamilton laboratory does the regulatory analyses of fertiliser and lime samples under the Fertilizer Act and Lime Transport Assistance Plan. Regular sampling and analysis of commercial fertilisers are carried out and lime samples checked to see that they conform to the standards set for purity and fineness of grinding. The laboratory now analyses all lines of fertilisers and lime used by the Division in its experimental programme and any other analytical work required.

Because of a probable world shortage of sulphur, special attention has been given to phosphatic fertilisers prepared without sulphur. In trials fused products such as calcium magnesium phosphate have proved equal to or better than superphosphate, and experimental "superphosphate" made with oxalic acid has given good results. Fixation by the soil of applied phosphates is a serious problem and chemical studies are being made on the different forms of phosphate, especially those in organic combination, in soils under pasture of varied phosphate topdressing history. In a pumice soil a sequence has been followed through on the same soil type from first ploughing to 20 years under pasture which has been annually topdressed with 2cwt. to 3cwt. of superphosphate. Over this period half or more of the phosphate applied has been built into organic compounds of low or slow availability in the soil. Another attack on the problem of phosphate utilisation has been made by using radio-active phosphate to "label" phosphate applications which can then be followed by a "radio-tracer" technique through the various phases of their cycles from first uptake by the plant, through the animal, return to the soil in dung, decomposition by soil organisms, and further uptake by the plant. Other trials designed to explore methods of phosphate utilisation include the application of phosphates in solution as a foliar spray, a method which has achieved some prominence overseas but has so far shown no advantage over normal topdressing at Rukuhia.

Peat land development is an important Waikato problem and has received particular attention from research officers at Rukuhia Soil Research Station.

Ground limestone for pasture topdressing varies in carbonate of lime content (purity), fineness of grinding, and "reactivity" (type of stone), according to the outcrop and works from which it is produced. To test the effect of these various factors as well as rates of application several comprehensive lime topdressing trials have been carried out. The trials to date demonstrate the more rapid action of the 60-120 mesh (fine) fraction, particularly for slowly reactive stones. Nevertheless the 16-30 mesh (coarser) material has greatly influenced yields. On these considerations the present fineness standard of lime for transport assistance seems to be quite satisfactory.

**Peat Land Development**

Peat land development is an important Waikato problem and has received particular attention from research officers at Rukuhia. Investigations with peat began soon after the station was established and have covered every aspect from detailed chemical and biological study and analysis to drainage, cultivation, fertiliser requirements, methods of pasture establishment, irrigation, and the growing of market garden and special crops.

The soil testing service provided by Rukuhia Soil Research Station is of considerable assistance to farmers for determining fertiliser and lime treatment of land.

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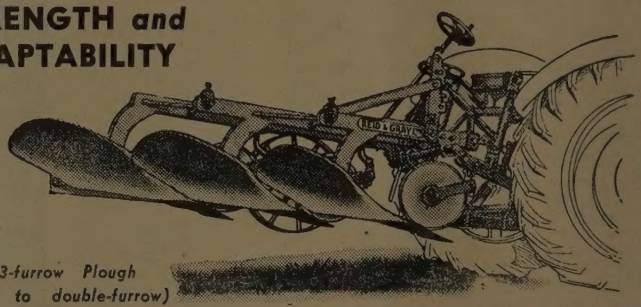

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Up to the present land improvement work has received most attention at Invermay Agricultural Research Station, for there are many thousands of acres of second- and third-class ploughable hill country in Otago on which pasture improvement has proved difficult in the past. Work at Invermay indicates that the correction of molybdenum deficiency may lead to the economical development of large areas of such land.

The work has produced a reliable guide for the development of Waikato peat lands.

## Invermay Agricultural Research Station

Invermay Agricultural Research Station, at North Taieri, was established in 1949. The total area is 1300 acres, of which about 200 acres consist of first-class alluvial land, 500 acres are undulating clay downs, and 600 acres are third-class hill country not previously cultivated. The station was established to test materials and methods before their adoption in co-operative trials, to investigate livestock management and feeding methods, and to study problems of marginal land development. Up to the present land improvement work has received most attention, for there are many thousands of acres of second- and third-class ploughable hill country in Otago on which pasture improvement has proved difficult. Work at Invermay indicates that the correction of molybdenum deficiency may lead to the economic development of large areas of such land. The economics of marginal land development are being carefully studied at Invermay and trials in operation cover cultivation methods, fertiliser usage, drainage, seed mixtures, methods of pasture establishment, and management and measurements of pasture production. The development of wood lots on steep, uncultivable country is also receiving attention.

### Experimental Programme

The limited area of first-class land at Invermay is used for crop and pasture trials to test the usefulness of new crop strains and varieties, pasture seed production methods, potato certification tests, and production from pastures with varying plant composition and under different systems of grazing management.

The 500-acre block of second-class land has been improved since the farm was established, and 120 acres (divided into 10 fields) has been set aside to provide a long-term rotational trial area to study soil fertility, crop and pasture production, and livestock management problems. The remainder of the area is being used for testing fertilisers, drainage experiments, crop tolerance trials with new spraying materials, and livestock trials. A 4-year trial has begun to investigate the relationship of pre-lambing shearing to wool growth and quality, and the rate of growth of lambs from ewes shorn before lambing compared with that of lambs shorn from ewes in November.

The 600 acres of third-class hill land is being used to investigate methods and economics of marginal land development. When improved it will be used for sheep and cattle breeding to supply the livestock necessary for experimental work on the rest of the station.

## Winchmore Irrigation Research Station

Winchmore Irrigation Research Station, Ashburton, was established in 1946 to demonstrate the value and investigate the problems of irrigation on the Ashburton-Lyndhurst scheme in particular and on Canterbury light lands in general. Water for the scheme is drawn from the Rangitata diversion race and the scheme serves an area of 64,000 acres. Winchmore Station consists of three sections, a dairy farm of 150 acres, a mixed farm of 350 acres, and a research section of 250 acres. The dairy and mixed demonstration farms were rapidly developed to study the economics of irrigation farming and both are now highly productive and profitable. The research area has been organised to investigate the use of water in crop and pasture production and to establish suitable grazing and farm management methods for irrigation farming. The area also maintains a dry land block to study the development of improved dry land farming methods.

Primary production in Canterbury has not increased much over the past 50 years and to secure increases in the future means must be found to make the light lands more productive. The low rainfall and low moisture-holding capacity of the light, shingly soils

Irrigating pastures by border dike at Winchmore Irrigation Research Station.

render perennial ryegrass-white clover pastures short lived and subject to summer dryness. More general use of subterranean clover, lucerne, lime, and topdressing could raise the carrying capacity of most of the light land by 50 per cent., but four times this increase could be obtained from irrigation, and the work carried out at Winchmore Irrigation Station is of great importance to Canterbury. The administration of the station is assisted by an advisory committee consisting of representatives of irrigating farmers, Government Departments, and local organisations and institutions.

**Research Area**

One of the main objects of the research area is to study methods of applying water and the moisture needs of pastures and crops, and the station is equipped with a small laboratory for soil moisture studies. Data collected from this work are of value both to practising irrigators and to designers of future schemes.

The research area deals with pasture production; management and utilisation methods under irrigation and dry land farming; fodder, cash, and seed crop production, and systems of farm management on a pilot trial stage. As better methods are worked out they are tested on the two demonstration farms and then made more widely known by instructors in their extension work with farmers. In addition the farm economics section of the Division is studying the economics of irrigation farming both at the station and with co-operating farmers and the information collected will prove of great value when consideration is being given to the establishment of new irrigation schemes.

**Mixed and Dairy Farms**

When the station was taken over the land was generally in poor, run-out pastures with a carrying capacity of about 1 ewe per acre. An area of 150 acres was set aside as a dairy farm and 130 acres of the farm has been bordered. The farm milks a herd of 80 cows and for the 1952-53 season produced 24,700lb. of butterfat. The mixed farm is 350 acres in area, of which 330 acres have been border diked. It is worked as a mixed cropping and fat lamb farm and the carrying capacity has been raised from 1.2 ewe equivalents in 1947-48 to 3.7 ewe equivalents in 1952-53. Both farms are worked on commercial lines and have demonstrated that dairying and mixed farming on light land under irrigation are profitable undertakings. So far management has been on conventional lines, but as data are secured on the research area pasture production and livestock and farm management methods will no doubt be worked out which will lead to a higher production level and the full exploitation of irrigation potential.

## EXPERIMENTAL WORK

The present system of extension and research began in the early 1920s when a few professional instructors in agriculture were appointed to study farming problems on a scientific basis and advise farmers on improved practices. In the intervening years the organisation has grown and has had a marked influence on the development of primary production.

In 1920 pasture topdressing was a recognised practice in only a few districts and the initial work of instructors centred round an examination of the practice and its extension over as wide an area as possible. Early experimental work covered the effectiveness of different forms of phosphate on various soil types, the value of lime, and time of application. Early autumn application of superphosphate, the rapid expansion in the use of lime, and the definition of soil types suitable for slag and rock phosphate all arose out of this early work. Gradually soil fertility problems of greater complexity came under review and the place of nitrogenous and potassic fertilisers, minor element deficiencies, and rates of application were studied and the present soil advisory service established. Soil fertility problems will of course continue and will require expanding research facilities for their investigation. New forms of fertilisers will have to be tried out, methods and rates of application studied, and minor element deficiencies investigated. Pasture topdressing has been the foundation of increased primary production during the past 30 years and its expansion on sound lines is likely to remain the keystone of an expanding farming economy in the future.

In the improvement of crop and pasture production and management field experimental work has also played an important part. Early work in crop production centred round fertiliser trials, but with the development of improved strains and varieties crop work expanded to test station selections in all appropriate districts and this now forms an important feature of the Division's work. In pasture production and management early attention was given to the establishment of pastures on marginal land and the regrassing of depleted and deteriorated pastoral lands. The foundation work in the 1920s and 1930s on these problems has proved of inestimable value in the recent programmes of land development. The trial and demonstration work with certified grass and clover seeds and their subsequent adoption into general farm practice have played probably as important a part as topdressing in increasing primary production during the past two decades.

As the factors involved in efficient soil, crop, pasture, and livestock management become more clearly defined emphasis on investigative and advisory work on farm management will become increasingly important. More productive soils, pastures, crops, and animals will have to be welded into systems of more efficient management.

## THE INSTRUCTORS

The Extension Division has a staff of well-trained instructors who work in very close touch with farmers. The instructors stand at the beginning and end of research problems, and while they are the link between organised research and the farmer they are also investigators of local problems. In general farmers want answers to particular problems rather than general information about advances in the science and practice of farming. They are interested in improving the production of their own particular fields and flocks and herds. Hence the Divisional organisation provides for investigative work to be carried out very largely on commercial farms in co-operation with the owners.

The scope of the experimental activities of the Extension Division has been given in outline only, and this outline necessarily omits many important sections of the work. This research is covering an ever-widening field. It requires a co-ordinated approach with a team in which the farmer, the chemist, the research officer, the field officer, and the statistician all play a part. The work is integrated with that of appropriate sections of the Department of Scientific and Industrial Research, the agricultural colleges, the Soil Conservation and Rivers Control Council, and other research organisations. The cost of this extensive programme is but a small fraction of the benefits it produces, and is exceptionally low owing to the co-operation of the many farmers who assist its operation. In no small measure is the Department grateful to these farmers for their assistance.

# Half Way toward FAO World Food Targets

SINCE the more serious post-war food shortages in Europe and Asia have been overcome we in New Zealand are perhaps inclined to pay too little attention to the state of the world's agriculture. We should, however, realise that though events overseas may appear to affect us only remotely, in the long run they may have a considerable influence on our future prosperity and well-being.

Nearly 3 years ago a resolution was adopted at the 6th Session of the FAO Conference calling on member States to prepare agricultural production targets for the next 5 years. A recommendation was also made that member States should forward details of the policies they intended to put into action to bring these programmes to a successful conclusion. For New Zealand we did not set ourselves any definite target by 1956, but emphasised that the expansion of agricultural production was an objective accepted as being of first importance by the Government and the community as a whole.

As part of its annual report for 1953 FAO has published a summary of the general position after the half-way mark has been reached.

On the whole the picture that emerges is reasonably encouraging and gives grounds for restrained optimism. In most countries of the world agricultural production is expanding and though, particularly in East Asia, the increase in food supplies is not keeping pace with the growth of population, the full effect of agricultural development programmes has yet to be felt.

The survey appraises the problem of world agricultural production from two angles. In the first part there is a brief survey of production trends in the main geographical regions and this is followed by an analysis of production trends for the main agricultural products. The report concludes with an examination of some of the economic factors which may affect the ability of many countries to attain the objectives they have set themselves.

For the cereals, apart from rice, world production appears adequate and there is a real danger of supplies in North America outrunning the demand. No increase over the next 4 years appears likely. For rice the situation is rather different, for though production is expanding, it is not rapid enough. The greatest hope for the future lies in the improvement of yields as part of a general improvement in management practices on the part of the millions of small cultivators in South and East Asia.

The report suggests that by 1956-57 there will be an increase in the production of sugar, oil seeds, and vegetable oils, with smaller increases for meat, eggs, coarse grains, fruit, and beverages. Production of milk, cotton, wool, and cereals will remain about present levels.

We in New Zealand are particularly interested in the future for meat, wool, and dairy produce. For the first two there is little prospect of any significant increase in production and only in North America is the per capita production of meat higher than before the war. If present demand persists or more generally if there is a reasonable degree of prosperity in our overseas markets, prices should be well maintained.

For dairy produce the future is more uncertain, not because production has been expanding, but because there has been a general reduction in the consumption of butter. However, if butter is produced at competitive prices, there is little doubt that it can maintain its position.

Another problem which is becoming more serious for us is the accumulation of agricultural surpluses, particularly in North America. These tend to have a depressing effect on markets and by their very existence undermine stability. The disposal of these surpluses presents many difficulties, particularly in view of the world-wide dollar shortage. Nevertheless there is a general realisation that it would be a self-defeating policy to throw these surpluses on the world market without regard to the interests of other producing countries. New Zealand is following closely all proposals designed to deal with the problem and is keenly alert to any threat to her own interests. Since November 1953 we have been represented on the FAO committee on Commodity Problems and New Zealand was also a member of the special working party on disposal of surplus commodities.

In its analysis of some of the economic factors which will influence the realisation of production targets the FAO report draws attention to the heavy investment of capital in agriculture that most of these programmes require. Capital for all purposes is scarce in under-developed countries and one of the most difficult tasks facing their Governments is to weigh up the priorities for capital development. The report suggests that greater attention might be given to programmes designed to raise crop yields and improve agricultural techniques rather than to large-scale plans for irrigation and land reclamation. These will take a long time to bear fruit and are very expensive in both human and material resources.

We in New Zealand have to face the same issues, and though they do not appear to have the same urgency as elsewhere, they are serious enough and will have to be met. But we are also in a position to assist the under-developed countries with both capital and technical knowledge; in future there is likely to be a growing call on our resources.

This report and other evidence suggest that an expanding population will require considerable increases in production. It is true that a big proportion of the world's peoples cannot yet afford to buy the food we produce, and surpluses of dairy produce and competition from substitute foodstuffs may result in price reduction to some degree. The New Zealand farmer's safeguard will be his low production costs, and there is no better way of reducing these still further than by increasing productivity. The scope for doing this is acknowledged to be considerable.

K. J. HOLYOAKE, Minister of Agriculture

# Managing the Milking Machine

By W. G. WHITTLESTONE, Physical Chemist, Department of Agriculture Animal Research Station, Ruakura

THE first article in this series, which appeared in the April issue of the "Journal", outlined practical measures for the maintenance of a clean milking machine with minimum labour. This article aims at showing how by good management milking may be carried out with a minimum of effort and a maximum of milk production.

GOOD management starts with an understanding of the dairy cow. Like many domestic animals, she is easily trained and responds to good treatment with predictable and consistent behaviour. The cow which "holds her milk", kicks the teat-cups off, or generally makes a nuisance of herself in the shed often reflects the inefficiency of her milker as clearly as a dog reflects his master.

A cow by temperament is a quiet, slow-moving creature designed by nature to graze inconspicuously in grassy clearings in natural bush. Sudden noises or, even worse, unusual moving objects will alert a cow and inhibit her ability to let her milk down. Of a number of stimuli tried at Ruakura a slowly rotating wheel caused more disturbance to "let-down" than a noisy loudspeaker or a flashing light. But with repeated application the cows came to accept even the object which disturbed them most. In other words cows can be quickly trained and an object which first caused marked inhibition of let-down was accepted as normal after three or four milkings.

Such experiments show that a cow will respond best in a routine which suffers few changes, even if the routine itself is unnecessarily complicated. What causes most trouble is the occurrence of the unexpected at milking time so that the cows cannot settle down to an accepted procedure. The anxious milker who darts about the shed making unexpected moves and chattering as he goes will do little to help his cows to milk out properly. The quiet man who makes only necessary movements and always does the same things will produce an atmosphere most conducive to good milking.

**The first essential for efficient milking is a smooth, regular routine with no disturbances. The cows as heifers learn what to expect at milking time and so form good habits.**

## Cause of Let-down

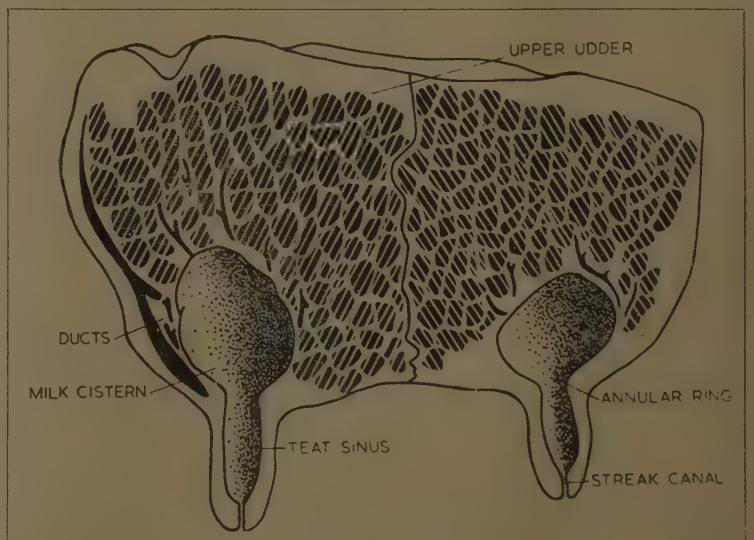
To understand why some procedures are better than others it is helpful to know how the cow lets her milk down. When the cow is washed and the strip cup used the sensations of pressure and touch cause a nervous message to reach the brain. This message is relayed to a small gland at the base of the brain, the posterior pituitary gland, which releases a substance (posterior pituitary hormone) into the bloodstream. When it arrives at the udder the hormone causes the contraction of a special sort of muscle mechanism. The milk is secreted into and held within very small roundish units (alveoli) connected by small ducts which join and rejoin like the twigs and branches of a tree until large ducts are formed. Because of the fineness of the small ducts the milk is held within them and within the alveoli as water is held in a sponge. Around the alveoli and along the ducts there are elastic (myoepithelial) fibres which form a basket-like network. As the alveoli fill with milk the baskets stretch. When the posterior pituitary hormone reaches the udder (about 25 seconds after release) the baskets suddenly contract and cause the milk to flow into the large ducts and milk cistern, from which it can be drawn by hand or machine. As long as the contraction lasts milk can be withdrawn. When it ceases only the milk left in the large ducts and milk cistern may be removed.

The time of contraction depends on how much hormone is released when the cow is stimulated. This depends on the cow and on the effectiveness of the stimulus. The time of let-down may vary from a few seconds to several minutes and under ordinary shed conditions appears to range from 2 to 10 minutes. Often throughout milking let-down will occur twice or more exceptionally three times.

The let-down reflex, as it is called, is like many other reflexes in animals; it may be trained or conditioned. The natural stimulus for the cow is the bunting or suckling of the calf. A vigorous washing procedure and the taking of a few squirts from the teats is the best imitation of the calf's action, and so is one of the best ways of stimulating let-down. However, the sounds of the cowshed, the act of being bailed up, and similar stimuli may become so strongly associated with milking that they act as let-down stimuli. Such effects tend to occur most readily during the flush when the udder is full, and there are cows which become a problem because of their letting milk down while standing in the yard.

## Effect of Fear Stimuli

In addition to the positive control of let-down by the posterior pituitary hormone there is a mechanism which troubles the bad milker. Stimuli which produce fear cause the release of another hormone, adrenalin, which prevents the action of the let-down hormone. It does this by making the fine blood vessels in the udder contract and so prevents the let-down hormone from acting on the basket fibres. If a cow is frightened before milking, it may take several minutes before she is capable of having a let-down. The cow has no control over this and even injecting let-down hormone will have no effect until the fright hormone (adrenalin) has gone from the bloodstream. (It is destroyed much more slowly than the let-down hormone, which is removed quite quickly from the blood.)




A simplified section of a cow's udder. The milk is held firmly within the spongy tissue of the upper udder and can be removed only if the cow lets her milk down. Toward the end of milking the teat-cups may crawl and cause the annular ring to close off. This results in milk being retained within the milk cistern; pulling down on the teat-cups (simple machine stripping) will remove this milk.

With this understanding of the cow it is possible to work out practical routines which will ensure rapid complete milking.

When a cow comes in her udder is often congested and painful. Machine milking will produce pain and fear, so preventing let-down. Gentle hand milking to start the cow, followed, once let-down has occurred, with machine milking is a practical step. If this fails, a veterinarian may give a dose (10 units intravenously, 30 units subcutaneously) of posterior pituitary hormone. This should be followed (after about 30 seconds for intravenous injection, and from 1 to 2 minutes for subcutaneous) by the putting on of the teat-cups. The effect of this is to associate the release of tension and pain in the udder with the milking machine.

**Attempts to machine milk a painful udder before let-down has occurred will probably produce such a strong association between the machine and painful effects that the cow will become a poor milker. This point is very important.**

If the cow is upset by the placing of cups on a painful udder, let-down becomes impossible. The first machine milking of each season should follow a definite starting by hand which ensures that let-down has occurred. In all but unusual cases this procedure is needed only once or twice and in extreme cases the veterinarian should be called in. Many a cow is spoilt by rough handling during the first few milkings of a lactation.

## Main Sources of Milking Troubles

It is one thing to recommend a procedure and another to deal with cows which do not behave properly. The four main sources of milking troubles are a faulty milking machine, bad training, troublesome cows, and bad management.

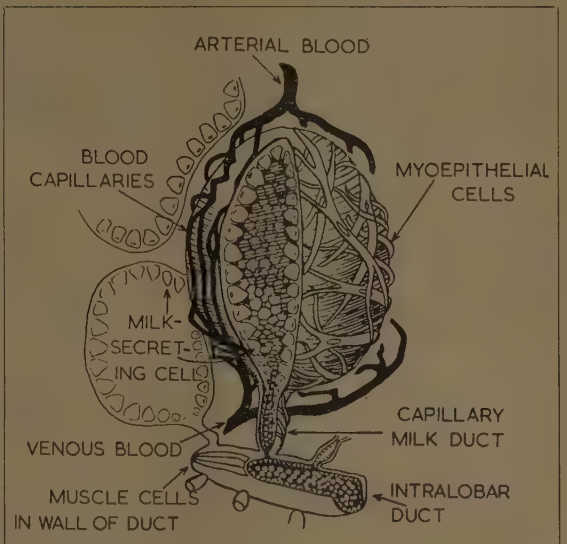
### A Faulty Milking Machine

Faulty milking machines will be discussed in detail in a later article in this series.

### Bad Training

The importance of bringing in the cows correctly has already been stressed. The importance of kind, sensible handling of the cows at all times cannot be over-emphasised. At the start of the season special care is needed.

Nature achieves her ends by the use of the pleasure principle. A clucky hen enjoys sitting on the cool eggs, as they remove the irritation from the skin in contact with them. A cow enjoys the release of tension from her udder and, provided it is not painful, the greater the tension is the greater will be the response to milking stimuli. The milker who understands this and makes milking a process which gives pleasure, not fear, will be well rewarded for his efforts.




A simplified diagram of an alveolus (after Turner). Blood capillaries supply the milk-forming substances, which are transformed into milk by the milk-secreting cells. The milk is stored in the alveolus and can be removed only when the myoepithelial fibres (which form a basket-like network) contract. The let-down hormone, released when the cow is stimulated, causes this contraction and the milk is then forced into the bigger ducts, from which it flows easily into the milk cistern.

### Troublesome Cows

Cows, like men, have different temperaments. The ideal cow lets her milk down in a single response and the machine draws it away quickly so that the process is complete in 2½ to 3 minutes. There are two sorts of fault which spoil this ideal reaction. Sometimes the top of the hollow within the teat is slightly constricted. When the pressure within the udder falls during milking the cups crawl up the teats a little and cause the teats to close off near the top. Milk flow thus stops before the udder is milked out. It is wise to discover which cows may have this fault and, as soon as the milk flow indicator starts to clear, to pull down on the cups to release the milk trapped in the cistern. If this pulling or machine stripping is delayed, let-down may go out of action and the cow will need restimulation by vigorous machine stripping and udder massage to get all the available milk.

This leads to the second kind of fault. When a cow is disturbed she will not give a full let-down and as a result will not milk out properly. Some cows once they have passed the flush seem to be incapable of a good let-down even when not disturbed. In such cows when the indicator shows a slowing up in milking rate the cow should be restimulated by massaging of the udder and pulling of the cups. This will produce a second let-down. The difference between this and cup crawling is easily seen. If milking slows up because of cup crawling, as soon as machine stripping is started there is a rapid flow of milk which dies away. When a second let-down occurs there may be a short

## Rules for Fast, Clean Milking

No matter what system of milking is used, the following rules are necessary for fast, clean milking:—

1. Bail up the cow without leg roping. Leg roping is a dirty, unnecessary procedure unless the cow is particularly wild.

2. As soon as the other cow in the bail slows up in milking rate or in a double bail as soon as each cow is brought in wash the udder vigorously with plenty of rubbing (to remove dirt and to stimulate the cow). Use a hose and the hands to ensure a thorough removal of dirt. A final rub with an udder cloth soaked in a quaternary disinfectant is recommended by overseas workers who aim at high standards of hygiene.

3. Take a squirt from each teat, preferably into a strip cup. This stimulates the cow and enables the milker to check for mastitis.

4. Place the teat-cups on *immediately*.

5. When the milk flow rate begins to fall, as shown by the milk flow indicator, press down on the cups if necessary and massage the udder gently downward.

6. Remove the cups when the indicator clears.

7. If the cow suffers from cracked or sore teats, apply an antiseptic cream *after* milking, but never before, as this will contaminate the inflations and in any case reduce the value of this treatment.

With cows which tend to have a double let-down, make sure that they are properly stimulated during washing. When machine stripping, massage the udder vigorously to stimulate a second let-down. When the second flow appears the cow will continue to milk by herself. Time may be saved with such cows by anticipation of the slowing of milking rate and by the starting of machine stripping at the first sign of a fall in rate.

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burst of flow when the cups are pulled and then after ½ to 1 minute there will be a rush of milk which will continue after machine stripping is stopped. This is caused by a further release of let-down hormone.

When a cow is known to have a tendency to produce a second let-down she should be given a specially vigorous starting stimulus and machine stripping started as soon as the flow rate starts to fall. There is evidence that a tendency toward double let-down is inherited. If the effect is so marked that the animal upsets the shed routine, culling is the only practical solution. The perfect cow milks quickly without any sort of stripping. Most cows require very little additional pulling on the cups (simple machine stripping) if the cups and claws are chosen to have a total weight of about 6lb. and the cup mouthpieces are designed to give minimum crawling. Unless machine stripping yields a significant amount of milk, it may be abandoned, as leaving ½lb. or so of milk in the udder will have no effect on total production.

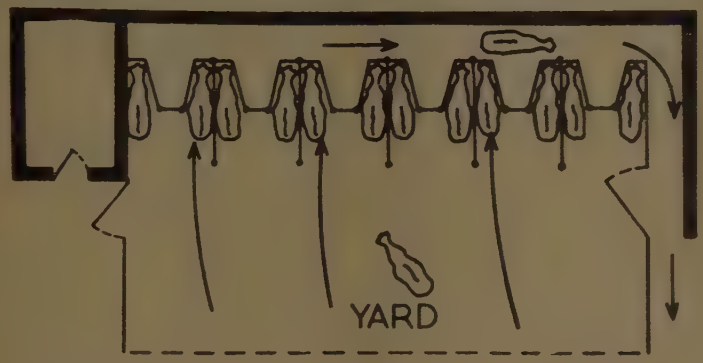
**Bad Management**

There are many factors in the management of the shed which can slow down the average milking rate. Such factors may be divided into two groups—the farmer's methods and the layout of the plant.

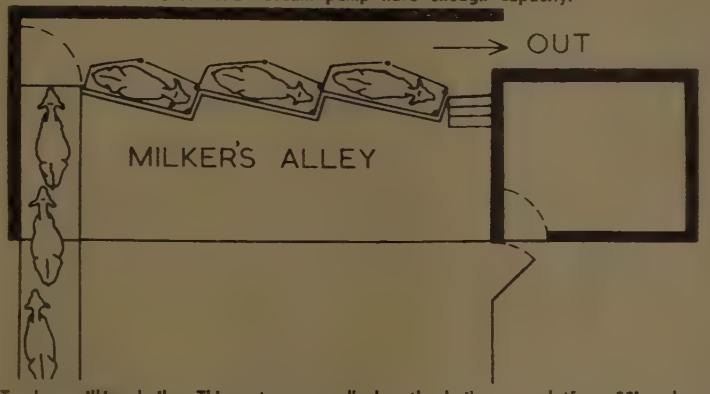
Bad farmers' methods which may cause trouble are:—

1. The use of dogs or force in bringing the cows to the yard. Disturbed cows do not milk well.
2. Unnecessary movements in handling the cows. Leg roping is a case in point. This is quite unnecessary in a normal herd. It is also wise to train the cows to accept any bail instead of going habitually to one bail. This makes for flexibility in handling and avoids disturbances caused by the wrong cow going into the wrong bail.
3. Washing the cows some time before putting the cups on. This is a very bad practice. It results in let-down occurring some time before milking, with the result that it ceases to be effective before all the milk is drawn. Often the cow will have a second let-down owing to the stimulation of the machine. Some cows need vigorous machine stripping to get the available milk. The udder should be washed and the strip cup used **immediately** before the cups are put on.
4. Leaving the cups on too long. This may cause pain and discomfort which will inhibit a second let-down to machine stripping if this is necessary. Such discomfort in any case is not conducive to winning the cow's co-operation. The cups should always be removed when the milk flow indicator has cleared.

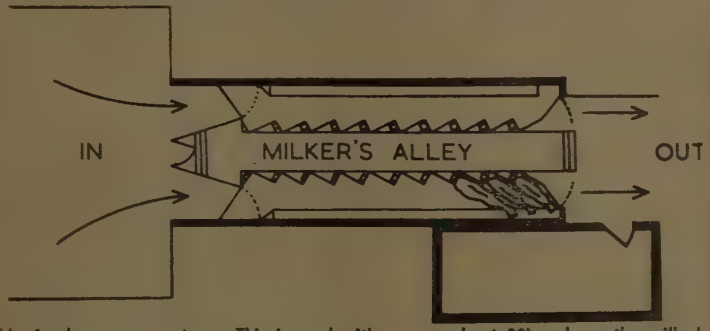
Machine layout may affect milking efficiency in a number of ways. In a single bail walk-through plant the end of milking should be slightly anticipated so that the next cow may be prepared to enable the cups to be transferred straight from one cow to the next. By watching the milk flow indicator a milker can start machine stripping immediately milking slows up a little. The next cow is washed while the second let-down (if any)




Normal walk-through bails. Used with a single set of cups per double bail, this system gives the highest possible turnover per set of cups. Skill is needed to ensure that all cows are stimulated properly just before the cups are put on and at the same time to avoid the necessity for hanging up the cups between cows. The use of two sets of cups per double bail reduces turnover per set of cups while increasing per man capacity. This system simplifies correct stimulation and the immediate putting on of cups. When a plant is doubled-up it is essential to ensure that the releaser and vacuum pump have enough capacity.




Tandem milking bails. This system normally has the bails on a platform 30in. above the floor on which the milker stands. The cows come in the rear gate of the bail and leave from the front gate. The system is hygienic, easy to operate, but cannot give the high efficiency per man or per set of cups possible with the walk-through (normal New Zealand) system. For efficient milking the cows must be washed in the milking bails, never in a separate washing bail.




Herring-bone race system. This is used with a race about 30in. above the milker's floor. The cows come in in batches of 10 and the teat-cups are transferred from one side to the other in sequence. The system depends on using a uniform milking time per batch, so that cows should be matched for milking time. The cows should be washed immediately before transfer of cups. This system is fair only in terms of turnover per set of cups, but gives an outstanding output per man.

occurs and the cups can be then transferred directly. Properly weighted cups and claws will do away with the need to pull the claws down by hand for any length of time.

In a double bail the same efficiency per set of cups cannot be maintained, though the rule that the cups should be put on immediately after preparation is more easily followed.

The average rate of milking as cows per hour per set of cups for single bail plants is 9½, and doubled-up plants average 6½. With good management these figures may be raised to 12 to 14 for single bails and 9 to 10 for double bails.

A recent development which may greatly affect milking efficiency is the use of the American-type raised tandem bail. Studies of this system in America did not give impressive results either in terms of milking rate per set of cups or in terms of rate per unit of labour. The best plant seen gave a rate of 35 cows/hour for a 3-bail plant operated by one milker and a half-time assistant who drove the cows into the race and measured out the fodder. He would count as half a man in the running of the machine. This is about 12 cows/hour/set of cups, which is good, but 23 cows/hour/man, which is only fair. A good New Zealand milker using a standard 4-bail doubled-up shed can handle 50 to 60 cows/hour and in a single 4-bail plant 45 to 50.

Two New Zealand tandem bail units studied gave much slower milking rates than good walk-through systems. One 6-bail 2-man unit averaged 7.1 cows/hour/set of cups or 22 cows/hour/man. The other reached 10 cows/hour/set of cups or 30 cows/hour/man. Both sheds would have milked faster if the management had been correct. However, an American practice of washing each cow in an end washing bail and then allowing it to stand while the next cow completed her milking was followed. Typical waiting periods in one shed were between 1¾ minutes and 2¼ minutes. This resulted in most cows milked in the middle and distant bails having a double let-down.

In both sheds studied the double let-down effect of premature washing was the most noticeable factor in producing slow milking. As a general rule cows should never be washed and left to stand. The raised bail tandem system should never use a separate washing bail; the cows should be washed in the milking bail and the cups put on immediately.

Such bails can never be as efficient as the walk-through system in turnover per set of cups because of the delay in transferring cups from one cow to the next. However, there is no need for the slow per set of cups rate so common in America. Washing in the bail was practised in the shed described, which averaged 12 cows/hour/set of cups.

Another type of layout has also appeared or rather reappeared in recent years. It is the race type of shed. Modern modifications use a "herring-bone" pattern which makes it possible to pack 10 cows into a relatively short raised race. Used as a single race the system is poor because of the delay in replacing the batch of cows. However, as a double system it has interesting possibilities. In the double system 10 cows are brought in, washed, and the cups put on. The cows should be washed and the cups put on immediately. The next lot of 10 cows is then brought in and, working down the race, the milker washes the first cow of the second lot and transfers the cups from the first of the previous lot. This procedure is followed down the line, the third lot brought in, and so on. The system makes it possible to prepare a cow and transfer the cups immediately. It depends on the milking times of the cows being relatively uniform, so that the batches must be matched roughly for milking time. Unless this is done the cups may be left on some cows too long.

Used efficiently, with 10 sets of cups in a double 10-cow race, this system makes it possible to milk 80 cows/hour/man or 8 cows/hour/set of cups. The former figure is outstanding, the latter below average. The system well merits study in an attempt to reduce labour costs. Two faults may occur in its management: The putting on of the cups may be delayed until all the cows in a batch are washed and a few slow milkers may cause the rest of the batch to have the cups on too long. Used properly, however, the system supplies a sound routine and a high level of man-hour efficiency.

Raised bail tandem sheds, despite the smaller potential milking rate, are attractive because they eliminate stooping and reduce the distance walked by the milker. The tandem system is very hygienic and easily kept clean. With careful design the raised herring-bone race system could be made satisfactory hygienically, and it offers minimum walking by the operator.

## Electrifying a Post and Standard Fence

CATTLE are becoming more numerous on Canterbury farms today, and would possibly be more popular if farmers were not afraid of their damaging fences. The illustration at right shows how one farmer in the Carew district solved this problem by electrifying the top wire of his fence. The barbed wire was lifted off the standards, which were twisted cold above the last plain wire with two standard straighteners until the top hole in each standard faced at right angles to its former position.

A small insulator was bolted to each standard with a metal washer under the head of the bolt and another under the nut. After the nut was tightened the bolt was cut back, leaving one visible thread. This was riveted lightly to the nut to prevent loosening. The cost of the work involved in the electrification was estimated at approximately £10 per mile.

*—R. INCH,*
*Fields Instructor,*
*Department of Agriculture,*
*Ashburton*

## Late Spring is the Best Time for Mole Drainage

IT has been proved that the best time to do mole drainage work is in late spring and early summer when the subsoil is still moist from winter rains, but the surface has dried out sufficiently to give good traction. Paddocks that are to be moled should be free from surface undulations, ridges, and hollows, as the mole plough depends on the surface for its grading of the channel. A bump on the surface will mean a bump in the mole channel and this can lead to very rapid breakdown of the mole.

Moling is a job that can be tackled quite easily by most medium to large wheel tractors, provided they have either steel wheels or rubber tyres plus steel grippers. This means that many farmers can afford to have their own mole ploughs and thus do the work at the best time.

In planning a mole drainage scheme it is important to see that the fall throughout the mole is continuous, and if there is any variation, fall should increase toward the outlet rather than decrease. The ideal gradient is 1 in 30, but moling can be done satisfactorily on gradients as gentle as 1 in 100, provided the surface is good, the soil is suitable, and the moles are not too long.

To get efficient drainage from moles it is usually considered necessary to space the drains at 6ft. to 9ft. intervals across the area to be treated. Any increase in the spacing, of course, will result in a corresponding drop in efficiency. Mole drains offer an extremely efficient and cheap method of land drainage if the drains are carefully planned and the soil is suitable.

*—D. F. SCOTT,*
*Machinery Instructor,*
*Department of Agriculture,*
*Auckland*

### List of Veterinary Surgeons

A list of registered veterinary surgeons in New Zealand as at 1 April 1954 has been published by the Veterinary Surgeons Board, and copies are now available from the Publications Section, Department of Agriculture, P.O. Box 2298, Wellington, at 1s. per copy, post free.

# A Tractor-mounted Land Leveller

THE average levelling requirements of cultivated land, except those areas which require a uniform grade throughout their extent, could well be classed as a smoothing of the major variations and the elimination of minor irregularities. The importance of levelling or smoothing a field before sowing to pasture should require little emphasis, as the advantages to be gained from this practice are so evident; the simplification of later mole draining, the reduction in wear and tear on implements and machines crossing the field, and the greater ease of mowing and haymaking operations are only a few. On arable land the benefits are as numerous, together with the fact that a good clod crushing and consolidating effect is obtained each time the leveller is used. A satisfactory tractor-mounted land leveller is described in this article by M. W. Cross, Lecturer in Farm Machinery, Massey Agricultural College, Palmerston North.

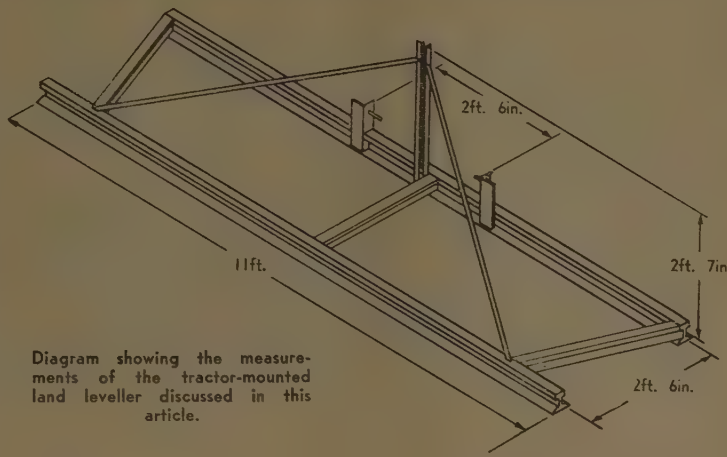



Diagram showing the measurements of the tractor-mounted land leveller discussed in this article.

THERE are many varieties of levellers in use, but the majority suffer from the disadvantage either that they require two men to operate them or that, being long, trailing units, often of wood, they deteriorate or can be readily damaged, are inconvenient in corners, and the operator has little control over their performance apart from towing them around the field over well-loosened soil.

To eliminate the majority of these faults the mounted leveller shown in the accompanying illustrations has been evolved. Convenience of operation is readily apparent. Corners can be levelled, transport and maintenance present no problems, the leveller is simple to operate, and a good degree of control can be exercised over its work. Furthermore it is cheap and easy to construct; the total cost should be no more than £30 to £35, even if all the materials and the labour are found off the farm.

With larger draught pins and a bigger top link pin hole the leveller can be fitted to any tractor with a hydraulic lift and 3-point linkage. For a larger tractor the width could be increased or a third bar added to the rear. If the width were increased, difficulties with gateways could be overcome by providing a towing link centrally at one end and dragging the leveller sideways. To obtain maximum utilisation of the leveller it is essential to use an adjustable top link, and at least one, and preferably two, stabiliser bars should be fitted to prevent excessive side swing.

Upper—The leveller in the raised position. It can be fitted to any tractor with a hydraulic lift and 3-point linkage. Lower—The leveller in the working position.

Materials required are:—

Two 11ft. lengths of heavy, straight railway iron (60lb. or 72lb. per yard) for the levelling bars.

Three lengths of the same or lighter gauge railway iron cut to 2ft. 6in., 3ft., and 3ft. for the distance stays. These lengths to have the base plate cut off so that a T section is left.

Two 10in. lengths of 3in. x 3in. x $\frac{1}{2}$in. angle iron for the draught pin posts.

Two 2ft. 7in. lengths of 1$\frac{3}{4}$in. x 1$\frac{3}{4}$in. x $\frac{1}{4}$in. angle iron for the top link posts.

Two 4ft. 9in. lengths of 1$\frac{1}{2}$in. x 1$\frac{1}{2}$in. x 3/16in angle iron for stays from the top link post to the rear bar.

## Construction Details

### Top Link Post

The two lengths of 1$\frac{3}{4}$in. angle iron are drilled 1$\frac{1}{4}$in. from the top to the required diameter for the top link pin. They are then welded to the centre of the front levelling bar. A distance-piece is positioned about 4in. below this hole and welded to both lengths. The bottoms of both lengths should be cut to conform to the profile of the railway iron and when the post is in position the top link pin should be vertically above the centre of the front bar.

### Draught Pin Posts

The two 10in. lengths of 3in. angle iron are drilled as near the leading

edge as practicable and 1¼in. from the top so that when in position the draught pins are about 4in. above the top of the front bar and ahead of its centre line. It is an advantage to have the pins nearer the front of the bar rather than the back so that there is a greater clearance between the rear wheels of the tractor and the spoil heaped up by the front bar. The pins point inward, thus permitting a spacing of 15in. to either side of the top link post with no difficulties of attachment of the draught links. The wider the distance between these posts the better, and for a larger tractor this measurement could be increased. One side of the angle iron is cut to fit the profile of the bar and projects forward; the other side is welded to the back of the bar at both top and bottom.

### Stays

With the levelling bars on a level floor and directly behind one another the centre stay (2ft. 6in.) is placed in position. For convenience it is placed alongside the top link post and is therefore not quite central. The two outside stays (3ft.) are then attached to the outside ends of the front bar and are inclined inward to meet the rear bar.

To increase the strength and rigidity of the leveller stays should be cut to fit the profiles of the front and rear bars. The stays are fitted so that the stalk of the T is downward and the bottom of the stay clears the ground by at least the thickness of the base plate of the front and rear bars. There is thus nothing bearing on the ground between the two levelling bars.

Finally, the two 4ft. 9in. lengths of 1¼in. angle iron are fitted and welded to the top link post about 4in. from the top and extending toward the outside ends of the rear bar.

### Using the Leveller

In operation a variety of effects may be obtained. For average smoothing or levelling the top link can be adjusted so that the front bar is just clearing a level floor with the rear bar touching. This allows for sinkage of the tractor wheels during work. If a Ferguson tractor is being used the quadrant lever should be set so that the hydraulic lift is almost coming into operation and the tractor should be worked in third gear as fast as is practicable. As the leveller encounters variations the hydraulic lift begins to operate and an automatic smoothing of the surface results. On other tractors the top link should be adjusted similarly to give the best results, and where desired the lift may be worked manually.

When soil is to be picked up such as when the top is being taken off a mound the top link should be shortened so that the rear bar is 4in. to 5in. clear of the ground and the full weight of the leveller is resting on the leading edge of the front bar. The convenience of a hydraulic lift for this type of work is evident, but it must be realised that a loosened surface is required for best results.

For final smoothing, consolidating, and clod crushing lengthen the top link and rest the full weight of the leveller on the rear bar.

The leveller has been in constant use, often under very rough conditions, but has always proved sufficiently robust to withstand the heaviest handling. For filling in plough finishes it is extremely efficient when used at right angles to the finish. It can be confidently recommended to anyone who owns a tractor fitted with a hydraulic lift and 3-point linkage.

# Meteorological Records for July

| Station | Height of station above M.S.L. (ft.) | Air temperatures in degrees (Fahrenheit) | | | | Rainfall in inches | | | | | Bright sunshine hours |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Approx. mean | Difference from normal | Absolute maximum and minimum | | Total fall | No. of days | Difference from normal | Maximum fall | | |
| | | | | Maximum | Minimum | | | | Amount | Date | |
| Kerikeri | 201 | 51.2 | — 0.7 | 68.1 | 33.3 | 8.40 | 19 | + 1.01 | 2.35 | 31 | 128.0 |
| Auckland | 160 | 52.8 | + 1.4 | 65.4 | 37.9 | 4.05 | 23 | + 1.41 | 0.65 | 7 | 107.9 |
| Tauranga | 10 | 49.0 | + 0.3 | 66.4 | 29.5 | 3.67 | 16 | — 1.37 | 1.62 | 21 | 143.9 |
| Ruakura | 131 | 47.0 | — 0.5 | 65.3 | 25.1 | 4.74 | 21 | — 0.01 | 1.49 | 21 | 99.0 |
| Rotorua | 975 | 45.5 | — 0.3 | 63.6 | 27.8 | 5.14 | 14 | — 0.50 | 1.37 | 21 | 115.1 |
| Gisborne | 12 | 48.7 | — 1.0 | 70.0 | 30.8 | 5.81 | 15 | — 1.40 | 2.74 | 31 | 159.0 |
| New Plymouth | 160 | 49.4 | + 0.5 | 61.2 | 33.8 | 5.82 | 18 | — 0.54 | 1.49 | 7 | 115.1 |
| Kariol | 2125 | 41.2 | — 0.8 | 60.2 | 26.5 | 6.00 | 17 | — 1.81 | 1.22 | 12 | |
| Napier | 5 | 47.8 | — 0.5 | 73.2 | 28.1 | 4.17 | 13 | — 0.74 | 2.28 | 21 | 150.3 |
| Wanganui | 72 | 48.6 | + 1.0 | 66.8 | 32.4 | 3.83 | 18 | + 0.91 | 0.87 | 9 | 103.5 |
| Palmerston North | 110 | 47.2 | — 1.1 | 66.7 | 28.0 | 4.38 | 18 | — 1.34 | 0.87 | 7 | 88.8 |
| Waingawa | 340 | 44.8 | + 0.3 | 68.3 | 26.0 | 4.54 | 19 | + 0.60 | 1.08 | 16 | 108.9 |
| Wellington | 415 | 46.7 | + 0.4 | 58.0 | 34.3 | 7.44 | 19 | — 2.08 | 2.50 | 16 | 95.3 |
| Nelson airfield | 5 | 43.9 | + 0.6 | 61.0 | 21.2 | 3.58 | 12 | — 0.35 | 0.94 | 16 | 153.5 |
| Blenheim | 12 | 44.6 | — 0.5 | 61.5 | 25.7 | 3.95 | 14 | + 1.34 | 1.33 | 16 | 142.8 |
| Hokitika | 15 | 44.4 | + 0.8 | 58.2 | 27.3 | 9.05 | 22 | — 0.55 | 1.72 | 1 | 110.2 |
| Hanmer | 1270 | 37.2 | — 1.3 | 60.0 | 19.0 | 4.67 | 15 | — 0.47 | 1.35 | 16 | 95.5 |
| Christchurch | 22 | 41.2 | — 1.1 | 63.9 | 24.0 | 3.47 | 13 | — 0.87 | 1.14 | 9 | 115.4 |
| Ashburton | 323 | 41.7 | — 0.6 | 62.6 | 23.0 | 3.42 | 15 | — 0.80 | 1.18 | 16 | 123.0 |
| Timaru | 56 | 41.9 | + 0.5 | 62.2 | 26.2 | 2.27 | 8 | — 0.54 | 0.95 | 16 | 130.5 |
| Alexandra | 520 | 36.8 | — 0.5 | 61.1 | 18.2 | 1.13 | 9 | — 0.47 | 0.44 | 16 | 118.6 |
| Taieri | 80 | 41.0 | + 0.0 | 64.8 | 23.2 | 3.21 | 14 | — 1.27 | 1.04 | 28 | 105.5 |
| Invercargill airfield | 9 | 41.1 | + 0.6 | 54.9 | 25.9 | 4.95 | 23 | + 2.14 | 1.62 | 25 | 68.5 |

## Book Review

## "The Story of the Kauri": A. H. Reed

BY collecting together and publishing in popular form a mass of information concerning the nature and history of the kauri forests A. H. Reed in "The Story of the Kauri" has rendered a service to present and future New Zealanders.

Before the arrival of the Maoris in the 14th century the widespread kauri forests had been reduced to the northern parts, and when the first white settlers came to New Zealand kauri forests were found only in areas north of the 38th parallel. Kauri timber played an important part in the early occupation because of its suitability for naval spars. Kauri trees are unique in that the massive bole has no taper and therefore the tree gives for its girth and height the greatest quantity of timber of any species.

This book has involved the author over many years in the examination and extraction of material from most of the known written sources, amply augmented by personal interrogation of old bushmen who have spent their lives working in kauri forests.

Because of the immense size of the trees amazing ingenuity was necessary in shifting the huge logs from the bush over extremely broken country to the mills. These operations, moreover, were conceived and carried out by bushmen who had no engineering training but only their practical experience to guide them.

The author pays well-merited tribute to the hardy and intrepid character of the old kauri bush workers and in a delightful narrative he gives a picture of their way of living in the disciplined life of the bush camps. He has also collected first-hand memories from wives who had kept house and reared their children while constantly moving their homes in the wake of timber operations.

An unbiased discussion of the choice of methods for perpetuating the remaining kauri forests, either by silvicultural treatment or by leaving them untouched, brings the information up to date.

An important and useful record is the unique collection of 275 photographs which forms the "Pictorial History" appended to the text.

—*M.S.*

**A. H. and A. W. Reed Ltd. 47s. 6d.**

## Publications Received

"Fruit": A summary of figures of production and trade relating to fresh, canned, and dried fruit and wine. Commonwealth Economic Committee: H.M. Stationery Office. 5s. net.

"Sheepfarming Annual 1953", 174 pp., Massey Agricultural College, Palmerston North. 10s.

"Industrial Fibres", Commonwealth Economic Committee, London. 5s. net.

# Range Rearing for Growing Poultry

By H. H. WATSON, Poultry Instructor, Department of Agriculture, Wellington

**THE successful development of growing pullets depends to a large extent on general management and especially on feeding, watering, and housing. Losses occur on many farms because of accidents and uncontrollable factors. Avoidable losses also occur through carelessness and mismanagement, such as overcrowded conditions, inadequate housing, lack of shelter, insufficient food and water containers, and outbreaks of diseases. After the growing stock are transferred from the brooder house to range conditions they should receive no checks, as this retards their body development. The stock should have every chance and this is achieved by giving them good food, a good fresh water supply, adequate housing, fresh pasture, and good environment.**

GROWING stock should get ample sunshine and provision should be made for shade and shelter from prevailing winds. By having the best possible rearing conditions growing stock will have every chance to develop normally as healthy birds and so have more resistance to diseases.

## Rearing Range

The range or paddock where growing stock are being reared should be fresh and clean. The grass should be kept short to allow sunshine to enter it and so keep to a minimum dampness after dew or rain. Stock such as sheep will keep a substantial block of land well grazed, and the pasture on a small piece of land can be mown before the chicks go on to it. Range houses should be repaired if necessary, cleaned and sprayed, and placed alongside a hedge or trees in a position sheltered from the prevailing winds. Range shelters or colony houses should be spaced so that growing stock will be spread over as wide an area as practicable. This avoids concentration of perhaps several hundred growing stock on a very small area and so reduces the risk of an outbreak of disease.

The chicks are transferred from the brooder house to range conditions when they are from 5 to 8 weeks old. The age at which they are moved depends mainly on space available in the brooder house, feathering, and the weather. Chicks can be perched either in the brooder house or on range, but usually conditions are more suitable for perching in the brooder house. Birds should be transferred on to the range during a spell of good weather. The birds should be graded according to size, and a convenient number for the size of range house should be placed in each. Any very small chicks graded out from the brooder house should be sold as culls, as they are a nuisance in a flock and have not satisfactory resistance to disease. When several groups of chicks are transferred from the brooder house they should be grouped according to age, as otherwise older birds will annoy the younger ones and this can retard their growth.

Perches should be temporarily lowered and food and water containers placed in the colony house in preparation for the chicks' transfer. After being transferred chicks should be kept enclosed for at least a day to allow them to become accustomed to their new quarters. Food and water can be given to them in the house. The following evening the birds can be allowed out on range, but to restrict their movements 3ft.-high wire netting should be placed in a semi-circular surround. This will keep the pullets near their own house and at dusk no trouble should be experienced in getting them back into the house. The surround can then be removed so that the following morning the birds have access to free range.

Water and food containers can be taken from the range house and placed outside near the house. Once the birds are familiar with their surroundings the food and water containers should be moved daily to a different position so that the ground in any particular spot does not become contaminated with droppings. This is necessary when moist mash is fed in V-shaped troughs and water is supplied in tins from a drum or by a similar method. When dry mash is fed it should be given in hoppers, which should be in a sheltered position, thus reducing waste owing to wind and rain.

## Feeding

Chicks when in the brooder house should receive 18 to 20 per cent. of protein in their total ration. The mash normally is a No. 1 standard chick mash plus 8 to 10 per cent. by weight of skimmed milk powder. The milk powder, apart from supplying protein supplement, supplies vitamin $B_2$ (riboflavin), a growth-promoting factor. In addition to mash they should also receive a ration of mixed grains. After the chicks have been transferred to free range the milk powder can be reduced gradually and after about a fortnight it can be omitted. The stock can be left on No. 1 standard chick mash until they are about 3 to 4 months old.

If they develop sexually too quickly (this can be assessed according to comb development), the mash should be changed over to a No. 2 standard chick mash plus 3 per cent. of meat meal by weight. This reduces the protein content and assists in checking sexual but not body development. No hard-and-fast conditions can be laid down, because though this procedure of feeding is often necessary for early-hatched (July and August) chicks, late-hatched (October) chicks may require additional protein supplement (meat meal) to bring them to maturity. Growing stock require 12 to 15 per cent. of protein in their total food ration.

HEADING PHOTOGRAPH: Free range for growing pullets, with range shelters spread over a large area. Shelter and protection of food containers from sheep have been provided.

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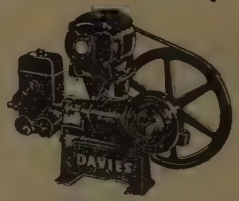


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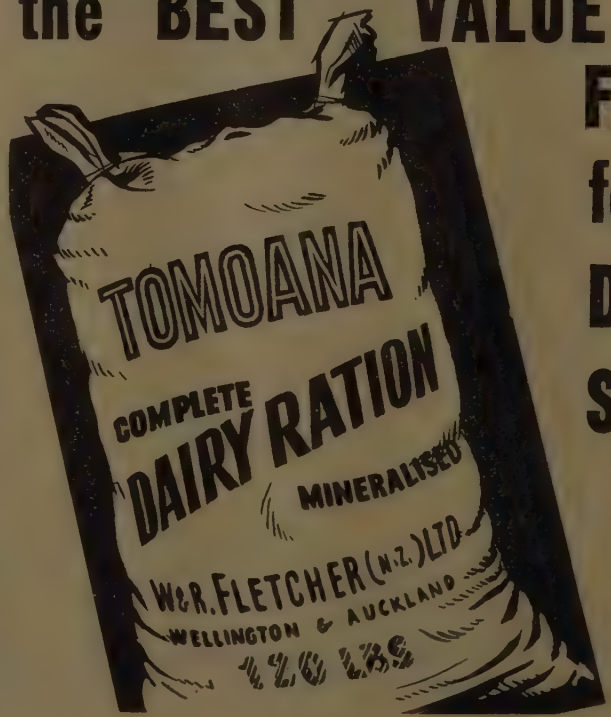

No. 1 standard chick and laying mashes contain 10 per cent. of meat meal; No. 2 standard mashes do not contain meat meal.

The quantities of fish feeding oil or synthetic powders containing vitamins A and $D_3$ in the food ration can be reduced provided the birds have access to ample supplies of greenfeed. During spring greenfeed supplies sufficient vitamin A, but during summer and autumn the quality of greens varies according to the weather, and additional vitamin A, either from a feeding oil or synthetic vitamin powders, should be mixed into the food ration and added according to the manufacturers' instructions.

The cost of rearing growing stock on free range is less than for those reared under intensive conditions, provided food is not wasted through wild birds, stock, or wind. Mash can be fed either dry in hoppers or moist in V-shaped troughs. Dry-mash feeding is the more popular, owing to the saving in labour. The hoppers should be sheltered from prevailing winds and protected from rain. If other stock such as sheep are in the same pen or paddock as the growing pullets, hurdles should be placed around the hoppers if they are outside the range houses. Dry mash should be available to the birds all the time. There should be 12ft. of feeding space to every 100 growing pullets when dry mash is given. A light grain feed should be given in the morning and again in the late afternoon, when the ration should be all eaten in about 20 minutes.

Moist mash is normally fed to growing stock in the morning and birds should receive as much as can be eaten in 20 to 30 minutes. The mash mixture should be crumby and mixed just before the birds receive it. Enough space should be available for all birds at the trough.

Pellets can be fed to growing stock either in dry-mash hoppers or V-shaped troughs. Though pellets are more costly than mash, they are becoming popular owing to their convenience in handling and because there is no waste.

**Grain**

Growing stock will eat whole wheat after they are 6 weeks old, but at this age they cannot digest the fibre of whole oats. If oats are being fed as portion of the grain ration, they should be hulled. Maize and barley are suitable grains. For feeding to young birds maize should be kibbled and barley clipped. A good grain mixture can be made up from the above ingredients. The proportions of each fed vary from district to district according to cost and the availability of the grains.

Wheat normally is the popular grain, with oats and maize next. Whole oats can be added to the grain ration and replace hulled oats when birds are from 10 to 12 weeks old, as then they can digest the fibre of the oat husk. Only the best available grains should be fed at all times. The grain ration can be the same up to the point of production. If supplies are ample, the same ration can be given to laying birds. Grain should be given at the morning and evening feeds.

Apart from mash and grain all birds require a calcium grit and a hard metal grit. Calcium is required for bone formation and for forming shells of eggs. Oyster shell or pipi shell grits are good sources of calcium. A hard metal grit lodges in the bird's gizzard and grinds up grain and food. Both grits can be placed in small boxes or troughs and should be in front of the birds at all times.

**Greenfeed**

Growing stock on free range will have sufficient supplies of greenfeed during spring, but in summer and autumn, when normally conditions are dry, additional greens, such as silver beet, kale, chou moellier, lettuces, cabbages, or lawn clippings, can be provided. If the only available greenfeed is dry and rank, an adequate supply of vitamin A should be ensured by feeding fish oils or synthetic vitamins as recommended by the manufacturers.

Fish oils can be mixed into mash or grain, but many poultry breeders prefer mixing the oil into the grain and feeding the oiled grain in V-shaped troughs or on clean pasture. The synthetic vitamins are in powders and must first be incorporated into dry mash.

## Water

An adequate supply of fresh, clean water should be within reasonable distance of the range houses. An automatic supply saves time and labour, but is not always practical, owing to cost of installation. A good supply can be provided by using 44-gallon drums. A tap can be fitted to each drum for supplying water to the drinking container. Drums can be arranged on a sledge or low trolly. When refilled they should be moved to different positions. Every care must be taken to minimise dampness around water containers and it can be reduced by placing slats or a frame under the containers. Shade should be provided above the water containers during hot weather. Regardless of the method of providing birds with water, care must be taken that the birds are never short of it.

## Housing

When growing stock are transferred to range they should have adequate housing. The popular type of house

Growing stock on free range in a sheltered orchard. The fruit trees (protected by wire netting) give some shade and will give progressively more as they grow. The grass is kept short.

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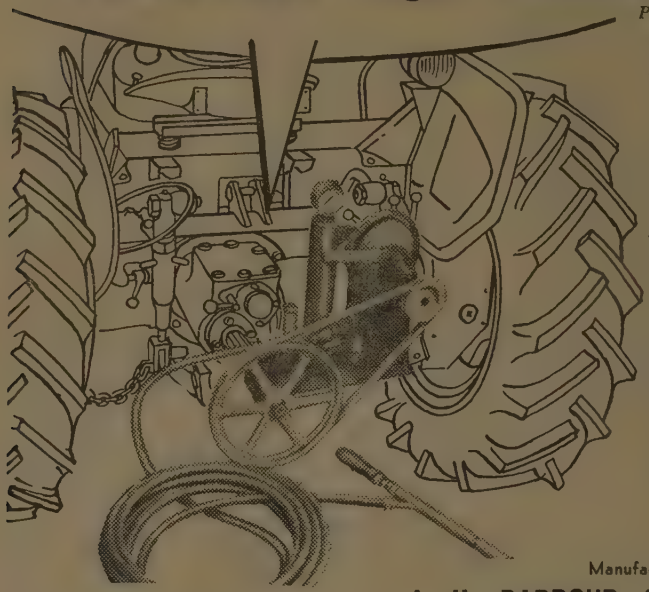

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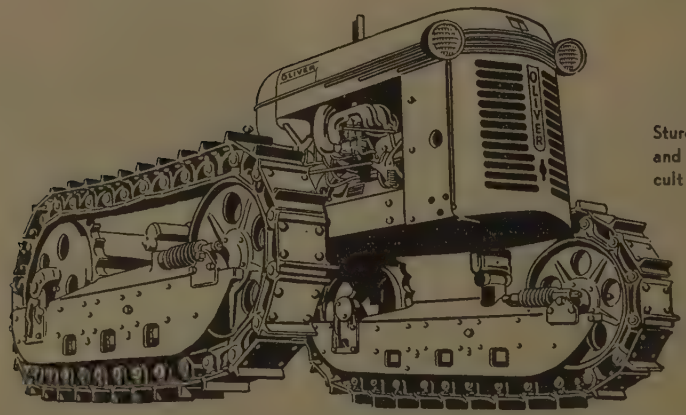


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in New Zealand is the range shelter, which consists of a wooden framework with wire netting floors, sides, and ends and a hip roof. The usual size is 8ft. 6in. long by 7ft. wide. The roof has an overhang at either end of approximately 21in. and at the sides of 18in. A 1½in. mesh wire netting floor is fitted 12in. above the ground, which allows the droppings to pass through.

The sides and the ends of the range shelters should be of a ¾in. mesh netting, as this keeps weasels, stoats, and other wild animals from entering the birds' sleeping quarters.

The range shelter has a door at one end with a small port-hole or trapdoor. The port-hole can be left open at night, but in districts where there are wild stock, ferrets, or weasels the birds should be kept enclosed. In such circumstances many farmers have fitted a trip attached to a spring to the port-hole. When birds come off the perches in the morning they stand on the trip, which releases a clip and the spring pulls the port-hole open, thus allowing the birds out on to free range shortly after daybreak.

Wire floor of range house. It is valuable as a disease control measure and as a labour saver, because there is no accumulation of droppings on the floor.

The open-air type of range shelter is very popular owing to its lightness and good ventilation at night. This type of shelter is preferred by poultry keepers even in districts where heavy frosts are experienced during spring. During extremely rough and cold weather sacks can be placed on the ends and removed when the weather improves. The overhang of the roof both at the ends and sides of the range shelter usually gives ample protection against the weather and allows a free circulation of air. Shelters can be left in the same place during the one season provided that the same group of birds is housed throughout the growing stage. If shelters or houses are required for a new group of birds. they should be placed on a fresh block of land. Droppings are removed when necessary from range houses, which usually need cleaning out only once or twice during the period birds are on range. This type of house holds 100 to 120 birds at the perching stage and numbers per house should be reduced as they develop.

Another type of colony house is oblong (usually 10ft. long and 8ft. wide) with sides and ends enclosed and a lean-to roof with a 2ft. overhang at the front. Good ventilation is necessary in this type of house. The floor can be of 1½in. mesh wire netting and should be about 12in. above ground level. This house should have a wire netting front. The house will accommodate 120 to 140 birds at the perching stage and the number should be reduced to 80 to 90 by the time birds reach maturity. The house is more costly to build than the range shelter and is heavier. It is advisable to have skids fitted on all range houses so that they can be moved when necessary.

## Disease Prevention

The prevention of disease is less costly than disease control. Suggestions made in this article, if carried out, will assist to prevent disease. Minor complaints should never be overlooked, as they often lead to major problems. The common diseases of growing stock are roundworms, duodenal-intestinal coccidiosis, avian leucosis (fowl paralysis), and external parasites.

A laboratory examination is often required to establish a reliable diagnosis of diseases, and in the event of losses affected birds should be forwarded to the Department of Agriculture Animal Research Station, Wallaceville. An accompanying letter should give full details of losses and symptoms noticed.

### Roundworms

As a routine measure all growing stock should be treated against roundworms when they are approximately 3 months old and again when they are transferred to the laying houses. Carbon tetrachloride and poultry worm powders may be used. As these drugs are poisonous, care must be exercised to guard against an overdose. Carbon tetrachloride must not get into the bird's windpipe, as if this happens, the bird will be killed immediately.

Recommended rates for carbon tetrachloride are 1 c.c. for birds 3 months old and 2 c.c. for adult birds (5 months and over). This can be given in liquid form with a drenching gun or in capsules. The birds should not be given food for 12 to 16 hours before they are dosed, but food can be given directly after treatment. The liquid or capsule must be placed into the bird's crop.

Many poultry farmers prefer poultry worm powders because this method of treatment is more convenient. The powder is mixed thoroughly into the mash and fed to the birds for 2 to 4 days. Directions for its use will be found on the container.

The powder's active ingredients are nicotine (as nicotine sulphate) and phenothiazine; the former drug destroys roundworms and the latter helps to eradicate caecal worms. After birds have been treated against worms all droppings should be removed as an extra precaution. However, it is not necessary to remove droppings when rearing houses have wire netting floors or droppings pits.

### Duodenal-intestinal Coccidiosis

When growing stock are kept in overcrowded and damp conditions the risk of an outbreak of coccidiosis is increased. The routine treatment against roundworms assists the birds to build up resistance against diseases, and coccidiosis is one of them. Stock suffering from the adult form of coccidiosis appear ruffled in the feathers and walk round slowly, have no interest in eating, and lose condition. This chronic type of the disease if not arrested in the early stages can cause heavy losses and in addition many birds take longer to mature, which affects egg production. Any ailing bird in a flock should be killed and examined by a qualified person to investigate the reason. Treatment with sulphaquinoxaline, nitrophenide, or nitrofurazone can be effective provided the disease has been identified at an early stage. These drugs are sold under proprietary names and the manufacturers' directions for treatment should be followed. After a course of treatment any of the birds that do not respond or brighten up should be culled from the flock and destroyed.

### Avian Leucosis

Avian leucosis or fowl paralysis is responsible for up to 40 per cent. of the total number of birds lost through disease in New Zealand. The infection is contracted by the chicks during the first few weeks of life, but

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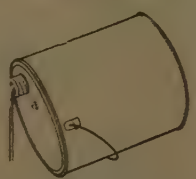

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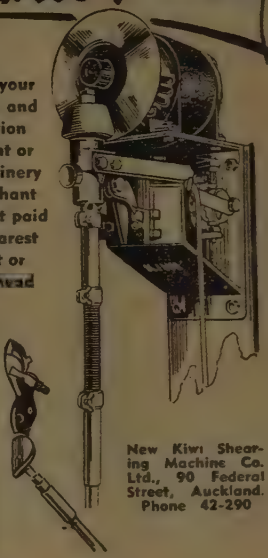



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symptoms do not appear until birds are from 3 to 9 months old. The period about the time birds come into production is regarded as a critical stage and many birds break down at this time. White Leghorns appear more susceptible than other breeds to avian leucosis.

The general symptoms are:—

1. **Nerves:** The affected nerves become enlarged and swollen, leading to paralysis of the part affected—leg, wing, and neck.
2. **Eye:** The normal pupil of a bird's eye is round, but in an affected bird the pupil becomes irregular and loss of pigmentation in the iris and and in many cases blindness follows. Crossbred stock often have uneven colouring in the iris and this could be misleading to a person who is not familiar with the eye form of the disease.
3. **Big liver disease:** The internal organs—the liver, spleen, and intestine—may become grossly enlarged and very often covered with tumorous growths. This form of leucosis is often termed "wasting-away disease", as the birds become very emaciated. The symptoms should not be confused with those of tuberculosis, because big liver disease rarely affects birds during the growing stage.

There is no known cure for avian leucosis and any bird should be removed from the flock as soon as it shows symptoms of the disease.

### External Parasites

The term external parasite covers red mites and lice. Usually these parasites do not appear if birds are kept in clean conditions before going on to range. However, periodical checks under the perches and around fittings should be made and if mites are found, perches and fittings should be painted or sprayed with a solution of kerosene and waste oil or creosote.

**Lice:** Though there are a number of different species of lice, those usually found on poultry are body lice, which are greyish brown and can be found around and below the vent. Pullets on range have access to dust baths and this assists in keeping lice in check. However, should any be found on the birds their perches should be treated with 40 per cent. nicotine sulphate. Perches should be wiped clean and a trickle of the solution placed along them just before dusk. After the birds have perched the heat from their bodies aids the fumes to penetrate into the feathers. The application of nicotine sulphate should be repeated about 10 days later. Also available are perch paints containing D.D.T., lindane, and benzene hexachloride and all of these are suitable for destroying lice. Dusting powders are not as convenient as the treatments mentioned for eradicating lice among birds on range.

## Transferring Pullets to Laying Houses

When pullets are near the point of laying they should be graded according to development and transferred to clean laying houses. Light breeds, such as Leghorns, will come into production when 5 to 6 months old and heavy breeds, such as Australorps and Rhode Island Reds, when from 6 to 7 months old.

After all of the growing stock have been transferred to the laying houses the range houses and equipment should be cleaned and disinfected thoroughly and, if necessary, repaired. Houses can be transferred to a sheltered position and placed on blocks. The land where the houses have been should be cleared of surplus manure and limed heavily. After a few weeks this land and nearby ground should be worked up and resown in pasture and, if possible, not used for birds for at least 2 years.

## Main Recommendations

The main recommendations for care of growing stock on range are:—

Range houses and equipment should be fresh and clean and ready before the growing stock are transferred from the brooder house.

Stock require good foodstuffs and ample hopper space, adequate supplies of fresh, clean water, and good housing in sheltered positions.

Pasture should be kept short during spring.

When conditions are dry a vitamin A supplement should be added to the birds' rations.

Sufficient perching space should be provided and birds should not be overcrowded on range. Young birds should not be mixed with older birds.

Routine dosing against roundworms should be carried out when the birds are 3 months old and again when they are 5 to 6 months old.

Dampness should be avoided, as germs thrive in moist warm conditions.

Outbreaks of disease should be prevented at all cost. Should disease occur, it should be identified and then treatment for control carried out.

Poultry Instructors are stationed in all the main poultry production areas and advice from these field officers should be sought. Plans of range shelters and bulletins dealing with all poultry subjects are available from Poultry Instructors, Department of Agriculture offices, or from the Superintendent, Poultry Industry, Department of Agriculture, P.O. Box 2298, Wellington.

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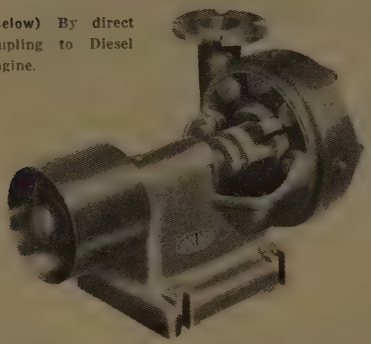

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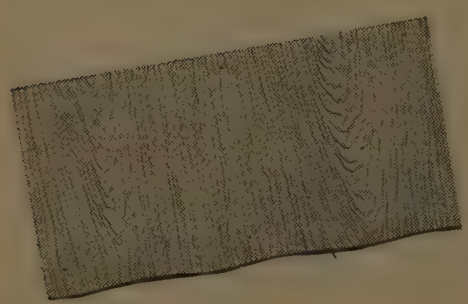

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# Potatoes for the Home Garden

POTATOES rank next to cereals as the most important food plant grown for human consumption and have always been one of the main items of food in New Zealand homes. Those produced on commercial areas are supplemented by the crops of a great many home gardeners, most of whom attempt to have potatoes available early, when prices are high, or late in the season, for long storage. Yields are very much affected by seasonal conditions and in certain districts by the effects of diseases. In the first part of this article the generally accepted cultural and disease control practices for potatoes in New Zealand are outlined by T. C. R. Dawe, formerly Horticultural Instructor, Department of Agriculture, Pukekohe. The section of the article on routine work for October is by W. G. Crawford, Horticultural Instructor, Department of Agriculture, Oamaru.

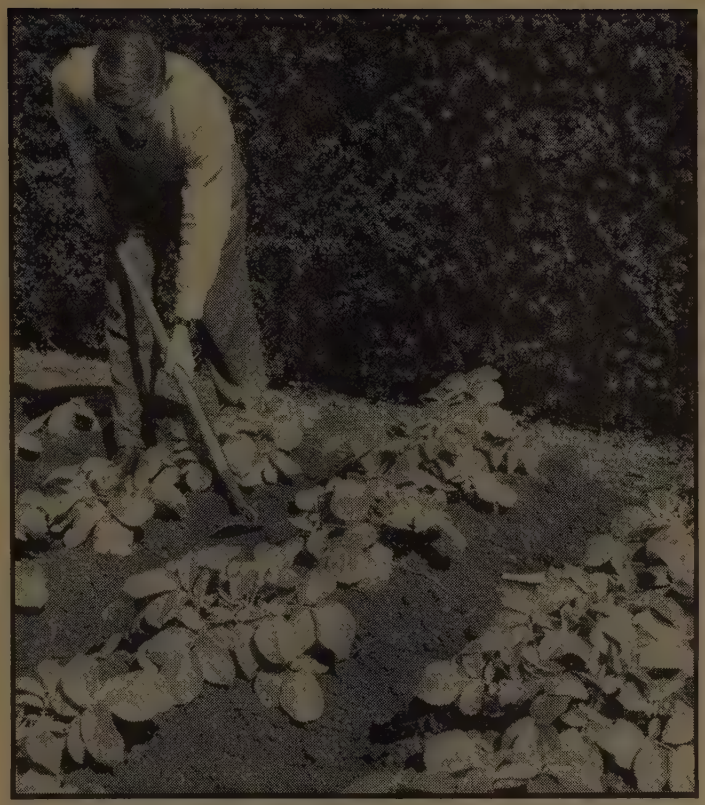
THOUGH climate has a very strong influence on the time of harvesting and the yield of the crop, the soil in most parts of New Zealand is suitable for growing potatoes. Home gardeners have little choice in selecting an area for potato planting and as a result the time of planting must be varied according to the weather which can be expected. In the more northern and warmer districts and in frost-free pockets planting can be done earlier than elsewhere. Accordingly, though some aim for new potatoes from their gardens by October, others are quite satisfied to dig their first tubers at Christmas.

If it is intended to grow early potatoes, the plot chosen should be one with a sunny aspect where there are no serious spring frosts to injure the plants after they appear above ground. Land should be well drained and protected from strong winds.

## Soils

Soils of many types will produce good crops of potatoes, but maximum yields are generally obtained from those which are loose and friable, reasonably deep, of high fertility, and well drained but retentive of moisture in dry weather. Soils influence not only yields but quality. Gardeners whose land is not in good order for potato growing may improve it by working in green crops or compost.

Potatoes may follow most other crops. Potatoes and tomatoes are closely related and are affected by the same diseases, so it is not wise to grow these plants too close in a rotation. Tomato plants do best in well-limed soil, whereas the lime content should be kept fairly low in soils where potatoes are grown to avoid infection by scab disease. Potatoes are particularly suitable as a cleaning crop in land freshly broken out of grass.



Light moulding is beneficial to early growth.

## Seed

Quality of seed is perhaps the most important factor in successful potato growing. It is not good practice to select seed from small and inferior tubers left after marketable grades have been selected from the crop. Though many of the small potatoes may be quite satisfactory, it is likely that a proportion of them come from plants of low vigour, possibly affected by virus diseases, and it is not reasonable to expect good yields from such seed. The continued use of inferior selections of potato tubers for seed results in further deterioration of the stocks.

Prospective growers are advised to purchase Government certified seed potatoes. They are obtainable from most seed and produce merchants. Certification implies that the parent crop has been inspected for trueness to type and freedom from disease by an officer of the Department of Agriculture. Given proper care and attention and grown in a suitable district certified seed should produce a good crop.

The practice of sowing their own tubers can hardly be recommended to home gardeners, except perhaps where experience has shown that little deterioration of the stocks occurs.

Sprouting of potatoes before planting is desirable but not essential. It is a general practice. Sprouted potatoes begin growing earlier and there are likely to be fewer failures among such seed, as tubers with weak or spindly sprouts can be discarded.

Sprouting should be begun at least 3 to 4 weeks before planting. Seed tubers should be placed in a shallow box or other container, with the rose or eye ends upward. The box should be placed where the tubers get full light, so that strong, green sprouts will be produced, but they should not be in direct sunlight or sprouting may be retarded.

The size of tubers to be used for planting may vary from as small as 1oz. to as large as 6oz.; as long as the tubers are from healthy stocks the smaller tubers are more economical and at times give a slightly higher yield of table potatoes. Larger tubers tend to produce a crop of more but smaller tubers. It is usual to plant tubers up to 4oz. whole, but often larger seed potatoes are cut lengthways, two sets each with at least two eyes being made.

After cutting, the tubers should be planted immediately into a soil which is neither over-wet nor over-dry and covered quickly. If this is done, the chances of misses occurring in the

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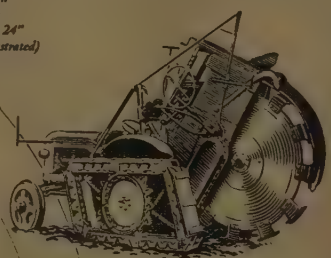

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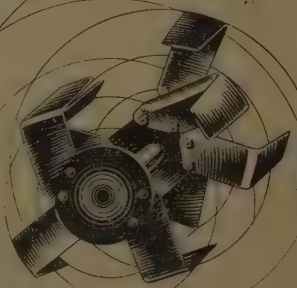

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crop are minimised. Tubers which are greened and sprouted show less tendency to "miss" after cutting than do tubers not greened and sprouted.

## Varieties

Many varieties of potatoes are obtainable throughout the different provinces, and gardeners should be guided by local experience. In northern parts of the North Island Arran Chief, Arran Banner, and Aucklander Short Top are favoured varieties for both early and late crops. Hawkes Bay gardeners have success with Epicure, Arran Banner, and Chippewa when planted for early crops; Aucklander Short Top is more generally grown for main crops. The more southern and western provinces of the North Island have good results from Arran Banner, Aucklander Short Top, and Glen Ilam. In the South Island many varieties are grown, including Aucklander Short or Tall Top, Arran Chief, King Edward, Inverness Favourite, Glen Ilam, Jersey Bennes, Sebago, and Dakota.

## Preparation of Land

Thorough and reasonably deep cultivation is usually desirable when preparing for a potato crop, though where the topsoil is shallow, it is inadvisable to cultivate to a depth that will bring the subsoil to the surface.

## Planting and Fertilising

Experience and experiments have indicated that better yields are obtained when fertiliser is placed in bands 3in. to 4in. wide along the drills rather than to broadcast it over the plot. It is best not to place the tubers in direct contact with the fertiliser, because they may be injured.

Large seed potatoes may be cut into two or more sets. The cord shows where the cut should be made.

Sprouting potatoes in a box.

Plant rows are usually 2ft. to 2ft. 3in. apart with the tubers 12in. apart in the rows at a depth of 2in. to 4in. Where plantings are early or where the soil is wet seed is usually placed at a depth of about 2in. In better drained soil and with late plantings seed is usually planted about 4in. deep. Shallow planting and frequent light mouldings have proved successful in warmer and early districts.

Liberal quantities of fertiliser are required to produce heavy yields of potatoes. Quantities will vary considerably according to the soil type and the past fertiliser history of the garden soil. All good potato fertiliser mixtures will include nitrogen, phosphates, and potash in some form. A mixture used frequently comprises 1 part of sulphate of ammonia, 3 parts of superphosphate, and 1 part of sulphate (or muriate) of potash, all by weight, but satisfactory proprietary potato fertiliser mixtures, in which the proportions and ingredients vary, are obtainable. Applications of fertiliser at up to 2½oz. per yard of row can be made with advantage, though in some districts twice this rate is commonly used. Lime should not be applied to the soil close to the time when potatoes are to be planted.

## Cultivation

After planting but before the plants appear above ground, surface cultivation may be necessary to control weed growth and to maintain a good tilth. Cultivation between rows should begin as soon as the plants appear and light hoeing should continue until the plants are approximately half grown, when light mouldings should be given, care being taken always not to interfere with root growth. A final high moulding completes the cultivation. At this stage the plants will have grown to a height where continuation of cultivation is impracticable without serious damage to plants.

## Disease and Pest Control

Not many serious diseases commonly affect potato crops, but several can very seriously affect yields and quality of tubers. Preventive or precautionary measures can be used effectively against most of these diseases, but virus infections cannot be controlled in most areas.

### Late Blight

Late blight (*Phytophthora infestans*) is a fungous disease present in all parts of New Zealand, but it is most troublesome on potato crops in the North Island, especially in parts of the Auckland Province, and in most southern parts of the South Island. Its development is favoured by warm temperatures accompanied by high humidity. The disease usually appears first as dark, almost black blotches on the leaves and stems. It may spread from foliage and stems to tubers, which become discoloured and eventually decay. Affected tubers are of no value and the crop from blighted plants is unsuitable for long storage.

Late blight can be controlled very effectively by the use of copper sprays. The most effective of these is Bordeaux mixture, which is usually applied at the 3 : 4 : 50 strength, which is prepared as follows:—

1. Dissolve 4oz. of copper sulphate (bluestone) in water.

2. Mix 5oz. of hydrated lime to a milky consistency in water.

3. Add the above mixtures to about 3 gallons of water, bring the total quantity to 4 gallons by adding more water, and stir thoroughly. The mixture should be used promptly or foliage may be damaged.

Proprietary compounds containing copper oxychloride used at the rate recommended on the containers also give very good control of late blight in most circumstances. Copper oxychloride is a little less effective for control of the disease than is Bordeaux mixture, but it damages the plants less and, if regularly and thoroughly applied, will give good results.

In northern districts, where late blight is almost certain to attack unprotected crops, regular spray applications at intervals of 10 to 14 days

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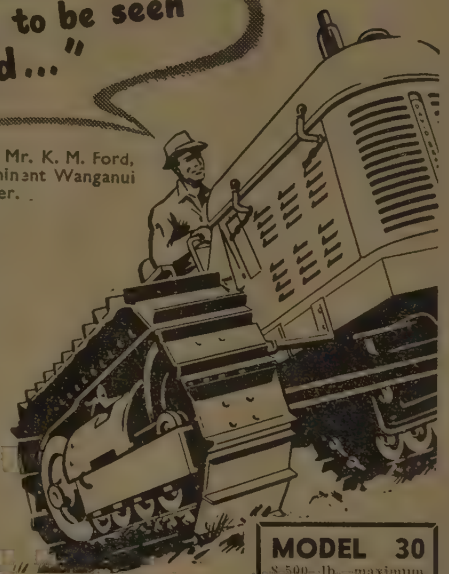

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are recommended and should be begun within a few days of the appearance of plants above ground. In some southern districts it is often possible for crops to be produced without applications of copper sprays for control of late blight. Where there is a reasonable likelihood of blight infection, however, spraying is a worthwhile insurance against the disease.

**Potato Tuber Moth**

Potato tuber moth (*Gnorimoschema operculella*): The adult of this pest is a night-flying moth which lays its eggs on the leaves of potato plants. When the larvae hatch out they burrow into the stems, causing injury to the foliage. Exposed tubers and those not sufficiently covered by moulding are also subject to attack by larvae hatched from eggs laid in the eyes of the tubers. Careful high moulding will assist in preventing attacks on tubers before digging, but if the moth is present when the crop is being dug, the tubers should be covered and removed from the garden as soon as possible to prevent attack at this stage.

The potato tuber moth is prevalent in the warmer and drier districts and its main period of infestation is from January to March.

Effective control of potato tuber moths may be secured by applications of D.D.T. at 1oz. of 50 per cent. wettable spraying powder to 4 gallons of water. Spray applications should begin early in December and continue at 3-weekly intervals until the end of March. D.D.T. may be used in combination with copper sprays.

When tubers are to be stored in bags or other containers where there is any likelihood of exposure to the moth D.D.T. dust should be applied to both tubers and containers.

**Virus Diseases**

Mosaic and leaf roll viruses affect potato crops in New Zealand. There are no effective means of controlling or eradicating these diseases which can be adopted by home gardeners. The diseases are carried over from season to season in the tubers and are spread from plant to plant during the growing season by aphides. Plants infected during the growing season show little or no effect, but tubers from infected plants produce plants showing varying symptoms. They depend on the variety attacked and the combination of viruses present and include leaf distortion, variegation or mottling of foliage, and curling, dwarfing, or dry dead spots on the leaves. Sometimes there is little effect except slight dwarfing of the plants. Plants are seldom killed, but are often very seriously weakened by the effects of virus diseases. Badly affected plants produce few or no potatoes of marketable size.

The best insurance against loss by virus diseases is to plant certified seed, which has been saved from crops reasonably free from these diseases. In the cooler districts periodical replacement of stocks may meet the position, but in warmer districts complete replacement of all seed each year is advisable.

**Scab**

Scab of potatoes or common scab (*Actinomyces scabies*) is caused by an organism which causes hardened, irregular, corky areas on the surfaces of the tubers. The scabs are usually shallow or slightly raised and may affect only a part of the tuber or all of it. Considerable freedom from the disease can be obtained by not growing potatoes on soils that have been heavily limed recently.

**Powdery Scab**

Powdery scab (*Spongospora subterranea*) causes rough, circular scabs with irregular margins and a powdery appearance in the centre of the scab. Powdery scab is less likely to affect crops grown in warm, well-drained soils.

Both kinds of scab spoil the appearance of potatoes and affect market returns and yields, but usually do not affect eating quality.

## Harvesting and Storage

With a considerable variation from the mild climate of northern districts to the colder conditions of the south New Zealand's potato harvest can be continued almost the year round. Harvesting of early crops begins in September or even August in the warmer localities in Auckland and Nelson Provinces, and the last of the main crop harvest in the South Island often extends into June.

Gardeners wishing to harvest early potatoes should exercise discretion and not dig until the plants have produced reasonable crops of tubers, though crops may often be used before the tops have died down. At this stage the crop will not be fully matured, so it is not advisable to lift more than is needed for immediate use.

Main crops for storage should be grown on and left for a period after the tops have ripened, and then dug if possible during fine weather. Many gardeners have difficulty in storing mature potatoes, and the main faults to be guarded against are damaged and disease-infected tubers. In most localities potatoes can be stored satisfactorily for a period in sacks or sugar bags, and care should be taken to see that a dry, cool, well-ventilated place in the shed is selected. At all times light should be excluded, as it causes greening of the tubers.

Potatoes may be stored in pits or clamps. This method is satisfactory only in the cooler climates; the higher ground temperatures in the northern districts cause sprouting. It is desirable to examine the potatoes held in bag storage occasionally and to remove any tubers in which rots have developed.

Keeping the rows of potatoes well moulded up assists in protecting tubers from the potato tuber moth.

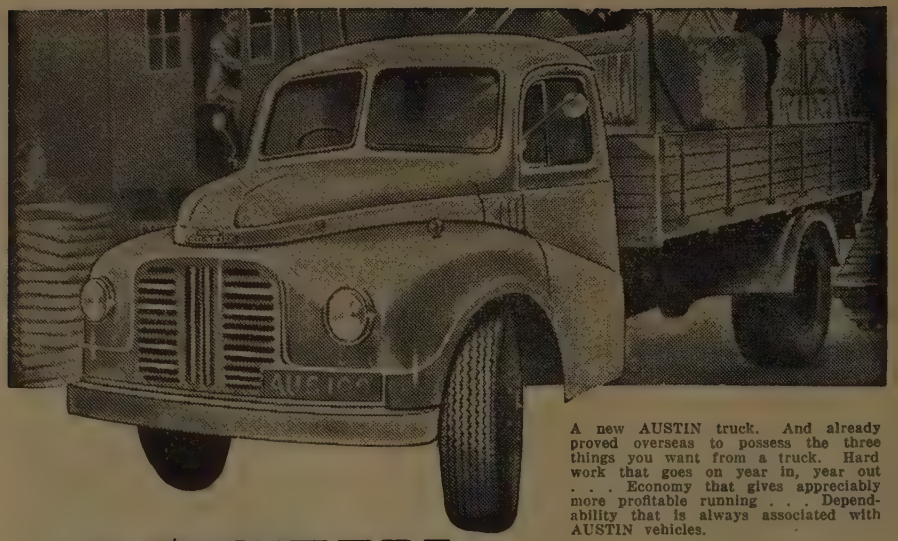
# Work for October

At this time of year, when growth of early sown crops is approaching its height, many important duties require the gardener's immediate attention. Failure to carry out essential work in the garden during October and November is usually reflected in poor quality crops.

Caution must still be exercised in sowing or planting frost-tender plants. Damaging frosts are still likely in many districts of the South Island, but in most northern districts tender plants such as tomatoes and marrows can be set out toward the end of the month.

All tall-growing plants such as peas and beans should have adequate support as they continue to grow. If the stakes used are weak, additional support can be given the plants by stretching binder twine between stout stakes at the row ends and along the rows at a height where the plant needs most support. One strand is usually sufficient for early or dwarf varieties and two adequately spaced for taller varieties.

Autumn-sown broad beans are best topped when they have set five or six trusses. The earliest beans should be used when they are young and tender. As the weather improves and the sun becomes warmer, the black aphis usually makes its appearance in the tips of bean plants. Early tipping of the plant does much to rid the crop of this pest. If there is an attack of



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the aphis, the crop should be sprayed with 40 per cent. nicotine sulphate, 1 part to 600 parts of soapy water.

## Late-autumn and Winter Crops

It is time now to prepare seed-beds for the sowing of winter greens and celery. Special care must always be taken in planning this part of gardening, as much depends on the condition of the plants when they are later lifted for transplanting.

The main factors are to work the ground well and to have it free of all weeds and in a friable condition. A base dressing of lime and superphosphate at 2oz. and 3oz. respectively per square yard should be applied. This is best lightly hoed into the top 2in. to 3in. of soil 2 to 3 weeks before sowing. Ample land should be worked so as to allow plenty of space between rows and for thin sowing. Restriction of space results in thin, spindly plants, whereas well-spaced plants are generally stocky, properly developed, and are less likely to be attacked by disease.

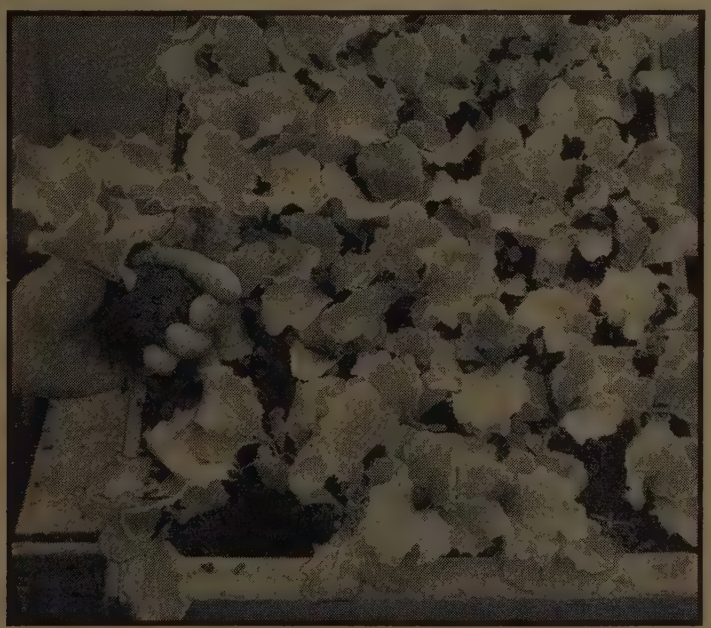
Early-sown crops of turnips, peas, beans, radishes, and parsnips will benefit from frequent shallow cultivation with the hoe. This benefits the crop by aerating the soil and eliminating weeds.

Spring cabbage, cauliflowers, and lettuce approaching maturity will benefit from weekly applications of liquid manure. If the soil is moist, a side dressing of sulphate of ammonia at ½oz. to a plant and lightly hoed in is satisfactory. Care should be taken to see that neither form is allowed to touch the leaves of plants.

## Sowings

**Brussels sprouts** are best sown toward the end of the month or early in November. Tall varieties produce heavier crops than dwarf varieties and have a longer harvest period. The tall varieties are suitable for flat sections, but the dwarf varieties are preferred for hillside gardens or areas exposed to high winds. Suitable varieties are Scrymgers Giant (tall) and Fillbasket and Exhibition (dwarf sorts).

October is the best month for sowing main-crop parsnips.



Lettuces should be planted out in moist, warm soil.

**Lettuce:** Great Lakes and Webbs Wonderful are suitable varieties for sowing now.

**Celery:** In the northern part of the North Island the variety Golden Self-blanching may be sown. Seed sowing in other districts is best postponed until early November.

**Spinach:** Frequent small sowings of the smooth-leafed varieties should be made.

**Parsnips:** October is the best month for sowing main-crop parsnips. A good variety is Hollow Crown.

**Turnips:** A small sowing of White Stone can be made.

**Beetroot:** Provided the soil is reasonably warm, the variety Detroit Red may be sown. Cool, wet soil and changeable weather are detrimental to this crop.

**Marrows, pumpkins, and squash:** These should be sown only in areas free of frost. Sowing should be delayed if frost is likely. Suitable varieties include: Marrows: White Bush and Green Bush. Pumpkins: Triamble, Queensland Blue, and Crown. Squash: Red Warren and Golden Hubbard.

## Plantings

**Potatoes:** Main crops should be planted without delay.

**Lettuce** should be planted out in moist, warm soil. Good varieties are Great Lakes and Webbs Wonderful.

**Cabbage:** Recommended varieties include Golden Acre, Hendersons Succession, Copenhagen Market, and Enfield Market. The soil should be well prepared and enriched with either artificial fertiliser or animal manures. Brassica crops in general respond well to heavy applications.

All photographs by Sparrow.

# Farming and Topdressing Trials on Banks Peninsula

By P. R. BARRER and D. L. JOHNS, Instructors in Agriculture, Department of Agriculture, Christchurch

IN recent years increasing interest has been shown by farmers on Banks Peninsula in pasture improvement by topdressing. The stage has now been reached on some properties where steps need to be taken toward improvement, or at least toward preventing the further deterioration of country. That it is possible to get excellent results in pasture improvement by topdressing has been shown in an extensive series of trials by the Department of Agriculture over a number of years on Banks Peninsula.

THE results of these trials in relation to farming practice on the different types of soil are given in this article with recommendations on fertiliser use.

## History of Farming

Banks Peninsula is believed to have been occupied first by the Maoris some 400 years ago, but apart from what was done by whalers the first recorded farming settlement was not until 10 November 1839, when 30 to 40 cattle were landed at Red House Bay, a mile south of Akaroa, on behalf of William Barnard Rhodes. At the time of the arrival of the 63 French settlers in Akaroa in August 1840 there were already 84 adult British inhabitants on the peninsula. The French settlers and others from 1843 grew their own wheat, potatoes, and vegetables. The first record of a sheep flock seems to be that of Greenwood Brothers, at Purau, who by 1844 had 400 sheep.

Of the total hill country on Banks Peninsula of approximately 220,000 acres, it is recorded in Captain J. Thomas's official report on 15 May 1849 that there were 134,000 acres of woodland. As this was the largest and most accessible area of available bush in Canterbury, an extensive timber industry sprang up, mainly from about 1850 onward, when the demand became great with the arrival of the colonists on 16 December 1850. The remainder of the natural cover was of tussock and native grasses, apart from very small areas of swamp in the small valleys near the bays.

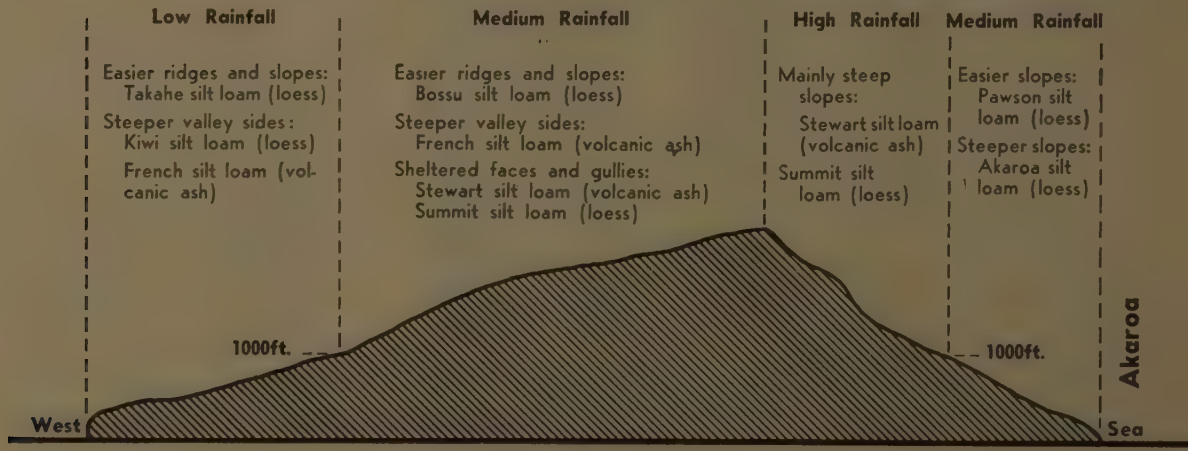
Despite the difficult nature of much of the peninsula country, some thousands of acres of land were ploughed and sown, first to crops and eventually to grass, in the main cocksfoot. The majority of areas were sown as in the original sowing in 1852 of R. H. Rhodes at Purau on the ashes of a burn—in most instances after bush, but in many cases after tussock. The remainder of the areas sown to cocksfoot were like that of Ebenezer Hay, who in 1853 on an area which had been stumped and sown to wheat harrowed in cocksfoot seed after the wheat.

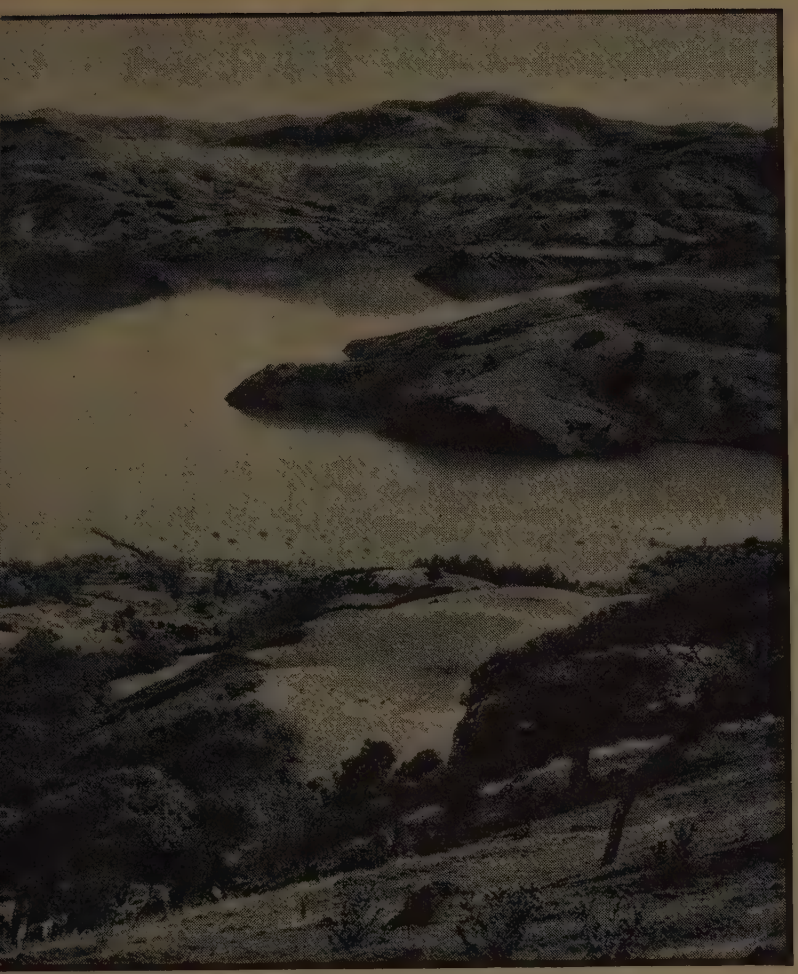
Some idea of the development of agricultural and grass farming on Banks Peninsula may be gained from the statistics in Table 1, 1870 being the first year for which such reference is available.

## Cocksfoot Seed Production

Starting with the Hays at Pigeon Bay, the threshing of cocksfoot seed became one of the major farming activities on the peninsula. By the 1870s settlers throughout the area were saving large quantities of cocksfoot seed, and the bumper year is credited

Diagrammatic Representation of Bank


Low Rainfall
Easier ridges and slopes: Takahe silt loam (loess)
Steeper valley sides: Kiwi silt loam (loess)
French silt loam (volcanic ash)
Medium Rainfall
Easier ridges and slopes: Bossu silt loam (loess)
Steeper valley sides: French silt loam (volcanic ash)
Sheltered faces and gullies: Stewart silt loam (volcanic ash) Summit silt loam (loess)
High Rainfall
Mainly steep slopes: Stewart silt loam (volcanic ash)
Summit silt loam (loess)
Medium Rainfall
Easier slopes: Pawson silt loam (loess)
Steeper slopes: Akaroa silt loam (loess)
1000ft.
1000ft.
West
Akaroa
Sea



as being 1874, when some 120,000 sacks of seed at 80lb. to the sack were harvested. From 1885 (when accurate figures were first kept) to 1895 the average yield was 214,700 bushels. From 1895 until the start of the First World War in 1914 over 20,000 acres annually, or 10 per cent. of the total area, was being shut up for cocksfoot seed production, with a peak area in 1905, when 31,918 acres were saved. From then onward seed production gradually declined, falling below 10,000 acres in 1924; below 6000 acres in 1939; and less than 1000 acres in 1949. The latest figure available was for the season 1951-52, when 662 acres were saved.

Banks Peninsula must have been a wonderfully fertile area to have produced these crops of seed for so long. During the time the areas were not being shut up for seed production they were being grazed by cattle, a practice which cocksfoot seed growers on the Canterbury Plains are not able to emulate. It was only when sheep predominated on the cocksfoot farms that the plant was not able to withstand the much more severe grazing to which it was subjected.

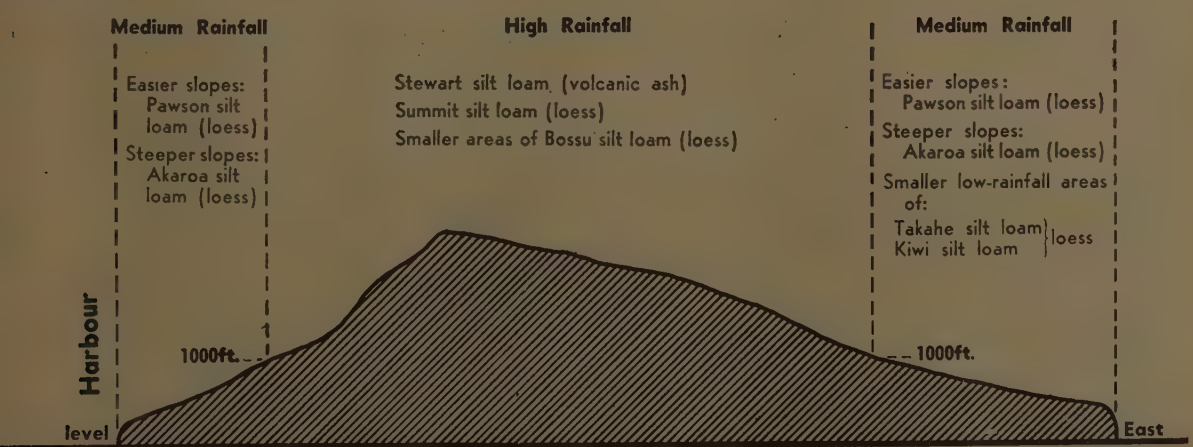
Though cocksfoot remains one of the main pasture species on the better sheep farms, the pastures are now too mixed on most farms to be suitable for seed production, even if it were possible for peninsula farmers to compete economically with the more modern harvesting facilities on the Canterbury Plains. The small amount of cocksfoot seed still saved is mainly on dairy farms and along roadsides.

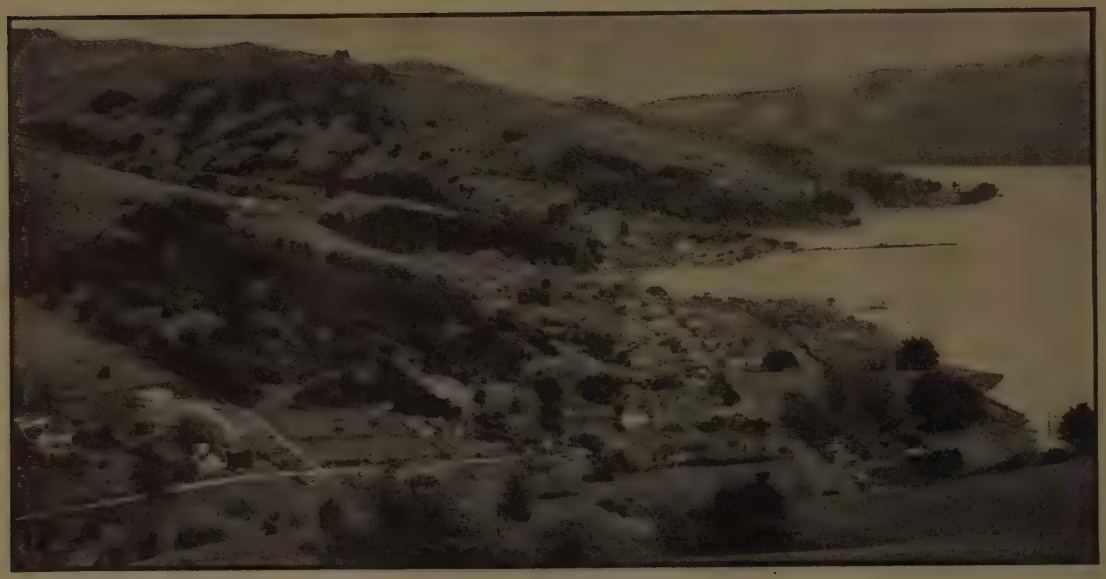
## Livestock

After the early introduction of stock to Banks Peninsula numbers increased as more land was cleared and sown to become available for grazing. The earliest reliable stock figures are for 1900, and the position since then is compared in Table 2.

Illustration at left: Looking north-west across Akaroa Harbour from above Akaroa township. National Publicity photo.

Peninsula Soils in Relation to Topography





Borough of Akaroa and part of Akaroa Harbour.

TABLE 1—EARLY CROPPING FIGURES FOR BANKS PENINSULA

| | No. of holdings | Wheat acres | Oats acres | Barley acres | Potatoes acres | Turnip and rape acres | Other crops acres | Total crops acres | Area in permanent artificial grass Ploughed acres | Unploughed acres |
|---|---|---|---|---|---|---|---|---|---|---|
| 1870 | 168 | 51 | 41 | 4 | 29 | — | 12 | 305 | 11,404 | |
| 1875 | 284 | 74 | 378 | 79 | 102 | — | 21 | 938 | 32,448 | |
| 1880 | 393 | 700 | 1,124 | 519 | 104 | — | 101 | 3,041 | 6,424 | 69,013 |
| 1885 | 455 | 370 | 140 | 167 | 61 | 1,079 | 100 | 1,917 | 6,866 | 99,558 |
| 1890 | 489 | 431 | 547 | 161 | 116 | 2,165 | 103 | 2,523 | 9,933 | 123,411 |
| 1895 | * | 85 | 777 | 1,012 | 64 | 3,118 | 98 | 5,154 | 21,447 | 131,236 |
| 1900 | * | — | 791 | 1,246 | 114 | 3,091 | 181 | 5,422 | 24,035 | 43,084 |

* Not known.

TABLE 2—FARMED AREA AND LIVESTOCK TOTALS

| | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1952 |
|---|---|---|---|---|---|---|---|
| No. of holdings . | * | * | 691 | 671 | 612 | 622 | 599 |
| Area occupied .. | 223,410 | 225,285 | 223,554 | 225,010 | 223,611 | 226,823 | 227,933 |
| Total sheep (at 30 April) . | 225,748 | 234,622 | 218,691 | 295,554 | 269,468 | 248,269 | 260,263 |
| Total cattle .. | 20,802 | 23,321 | 32,728 | 32,458 | 28,797 | 30,139 | 30,290 |
| Cocksfoot for seed | 29,690 | 23,367 | 12,704 | 7,364 | 4,576 | 403 | 662 |

* Not known.

Table 2 demonstrates the almost complete elimination of the cocksfoot industry as a feature of peninsula farming and also the decrease by nearly 100 in the number of holdings since 1920 through amalgamation of holdings. To gain some idea of the real stock position, however, it is necessary to go into more detail from the 1920 period onward (see Table 3).

These stock figure variations are more clearly shown in the graph on page 243. Dairy cows have declined in numbers ever since 1925, but have reached an apparently stable level now. Beef cattle on the other hand were at their lowest in 1935 (depression period) and have since risen to above their 1925 level. The sheep population reached its maximum in 1935 (depression period), but breeding ewes are within 1 per cent. of their 1925 level. However, total stock expressed as sheep units have shown a decline since 1925 of 7.4 per cent.

### Small Decrease in Carrying Capacity

The only conclusion that can be reached is that over-all on Banks Peninsula there has been a small decrease in carrying capacity as a result of a similar decline in soil fertility over the last 30 years. Certain individual farmers have notably increased their carrying capacity and output over this period. This has been done mainly by topdressing and/or liming, but associated generally with improved management. On some farms where management has remained the same and there has been no topdressing the carrying capacity has stayed much the same, but on many farms of this type it is inevitable after 80 to 100 years of farming that there should be some decrease in the fertility of the soil. The surprising thing is that this decrease should be so slight, but it is

again an indication of the initially high fertility of the soils of Banks Peninsula.

## Farming Pattern

The present picture of farming on the peninsula shows that dairy production is centred round the higher rainfall areas and small valleys. There are cheese factories at Little River, Barrys Bay, Pigeon Bay, Little Akaloa, Okains Bay, and Takamatua. During the 1952 season they had a total of 120 suppliers and the factories produced a total of 1167 tons of cheese. There are also some dairy farms at Gebbies Valley, Kaituna, Prices Valley, and in more isolated parts which supply cream to the Taitapu Central Dairy Company or milk to Christchurch for whole-milk consumption. Friesian and Friesian cross cows predominate in the Banks Peninsula herds.

Some 75 per cent. of the farms and 90 per cent. of the area of Banks Peninsula are devoted to sheep farming with beef cattle as a substantial source of income. On a very few specialised farms beef cattle are the main product.

The type of farming may be classified largely according to the rainfall. In the lower rainfall area (20 to 35in.) the land is held in larger blocks and the type of farming is of the more extensive kind with wool, store stock, and surplus breeding stock forming the main sources of income. Fewer cattle are carried in proportion to sheep than in higher rainfall areas and the main sales are of store cattle. In the higher rainfall area (35in. and over) the holdings are smaller and the type of farming is more intensive. The main products are fat lambs, wool, and fat cattle. A few farms specialise in the rearing of fat cattle for the Addington market.

As distinct from the rest of Canterbury, on the peninsula the Romney is the dominant sheep breed. The Little River ewe fair gives Canterbury farmers possibly their best opportunity of buying Romney ewes from

### Stock Numbers on Banks Peninsula

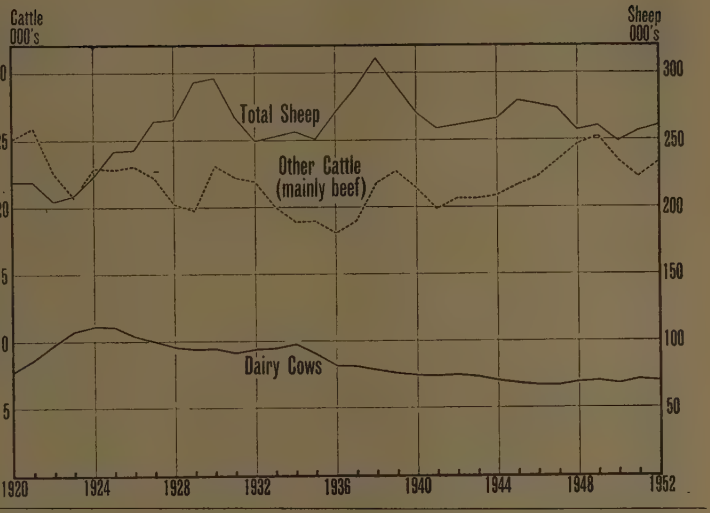



**TABLE 3—LIVESTOCK ON BANKS PENINSULA, 1920-24 TO 1950-52**

Average of Years:

| | 1920-24 | 1925-29 | 1930-34 | 1935-39 | 1940-44 | 1945-49 | 1950-52 |
|---|---|---|---|---|---|---|---|
| Cows in milk .. | 7,840 | 11,077 | 9,420 | 9,132 | 7,431 | 6,821 | 6,957 |
| Total cattle .. | 32,818 | 33,839 | 32,458 | 27,946 | 28,797 | 30,207 | 29,902 |
| Breeding ewes .. | 156,434 | 192,558 | 203,263 | 206,520 | 197,820 | 193,224 | 190,336 |
| Total sheep (including lambs) | 214,545 | 260,745 | 269,083 | 281,781 | 262,370 | 267,824 | 255,262 |
| Total stock expressed in sheep units* | 411,443 | 469,779 | 463,831 | 449,457 | 435,132 | 449,016 | 434,674 |

* Total cattle have been converted to sheep units in the ratio of 6 : 1.

**Below: Akaroa Harbour from the Barrys Bay district.**

Duvauchelle Bay, which is at the head of Akaroa Harbour.

within their own district. However, a large proportion of these surplus and cast-for-age ewes go back to other peninsula farmers.

## Topography

The present peninsula, roughly oval and reaching to a height of over 3000ft., is the remnant of a once much larger mass of volcanic rock formed principally by two volcanoes which had their centres in Akaroa and Lyttelton Harbours. Subsequent to the various volcanic activities natural forces have formed the system of radiating valleys and spurs on the outer slopes and greatly increased the extent of the interior slopes. The spurs have a relatively easy grade and reach the sea in wave-beaten sea cliffs often several hundred feet in height. The valleys between have steep sides and flat lower reaches of very limited extent reduced in the past by sea invasion. Apart from the lower slopes toward the heads of the two harbours the interior slopes are generally fairly steep.

The generally steep nature of the peninsula has made access to many parts difficult and many problems have to be faced in the formation and maintenance of roading. As a consequence transport costs are high and this factor, coupled with the physical difficulties of manually topdressing the country, has been responsible largely for the small amount of liming and topdressing carried out on the peninsula. Aerial topdressing, has been hindered greatly by lack of suitable landing strips within easy reach of a large proportion of the peninsula.

## Climate

The climate of the peninsula in its effect on pasture production is extremely variable. Aspect and altitude give rise to wide and sudden changes in effective rainfall and temperature. Average annual rainfall varies from about 25in. on the lower western slopes to probably well over 60in. in the higher central areas. An indication of the variation in rainfall figures at the lower altitudes is given in the following figures supplied by the Meteorological Service:—

TABLE 4—RAINFALL ON BANKS PENINSULA

| Station | Average annual rainfall in. | Highest monthly average in. | Lowest monthly average in. | Average no. of rain days |
|---|---|---|---|---|
| Akaroa (Onawe) .. | 38.56 (1937-1950) | 4.78 (July) | 2.28 (Nov.) | 145 |
| Allendale .. .. | 41.36 (1939-1950) | 4.95 (May) | 2.58 (Jan.) | 113 |
| Okuti .. .. .. | 47.84 (1915-1950) | 6.04 (May) | 2.91 (Nov.) | 94 |
| Magnet Bay .. .. | 27.41 (1917-1950) | 2.96 (May) | 1.88 (Oct.) | 94 |
| Akaroa .. .. .. | 44.31 (1894-1950) | 5.97 (July) | 2.66 (Nov.) | 94 |
| Akaroa lighthouse .. | 27.24 (1935-1950) | 2.99 (June) | 1.46 (Oct.) | 123 |

However, these rainfall figures are modified in effectiveness from place to place by direct exposure to the sun and the hot, drying north-west winds which sweep across the Canterbury Plains.

For practical purposes the vegetative cover at the time of the arrival of the early settlers gives a good indication of the areas which have reasonably adequate moisture conditions and those which suffer from seasonal moisture deficiencies.

Areas originally covered with forest vegetation have adequate moisture for most of the year and are affected only by long periods of dry weather. Most of the higher slopes, many of the inner slopes of Akaroa Harbour, the eastern bays, and the sheltered shady valley slopes in general fall into this category. With topdressing and proper management the maintenance of good white clover-based pastures should present no difficulty on these [illegible]

The slopes originally covered with tussock vegetation are those which are subject to regular seasonal moisture deficiencies. Included in this category are all the lower spurs and slopes exposed to the sun and north-west winds with the exception of most of of the Little Akaloa-Goughs Bay area. Over most of this area the maintenance of a good white clover-based pasture is difficult owing to the lack

of moisture. This lack of moisture can be acute even in short spells of dry weather. The worst affected areas are the sunny slopes from Godley Head to Motukarara and the northerly facing slopes about Lyttelton Harbour.

Aspect and altitude are again all important in regard to temperature. Based on average hill country conditions even the higher altitude sunny faces have a fairly long pasture-growing season. However, slopes lying away from the sun and exposed to cold southerly winds have very short pasture-growing seasons interrupted by unseasonal storms.

## Soils

Much of the underlying mass of volcanic rock of Banks Peninsula has been covered by a mantle of fine dust (loess) blown there from the ancient glacial rivers of the Canterbury Plains. The lower, easier slopes carry the greatest thickness of loess, but with increasing steepness the loess tends to thin out until near the hill-tops it disappears to recur on the tops of the ridges where the topography is easier.

Thus the soils of the peninsula are derived from two main parent materials, volcanic ash and loess. Soils derived from the former cover roughly a fifth of the area of Banks Peninsula and from the latter roughly four-fifths. The two groups are easily distinguished, the volcanic ash soils being characterised by their brown or chocolate brown colour and the loess soils by their yellow subsoils.

The following subdivisions into types of soils are made on the basis of parent material, climate, topography, and original vegetation. The various descriptions are given to enable each farmer to recognise the different soils on his own farm and then to associate with them their respective manurial requirements.

### Brown or Chocolate Brown Soils Derived from Volcanic Ash

The two types on this group are separated on the basis of the original vegetation, those with the lower effective rainfall being covered with tussock and those with the higher rainfall with forest. The types are:—

1. French silt loam: This type of soil occurs at all altitudes with rainfall varying from 25in. to 60in. and topography rolling to very steep. It was developed under tussock vegetation. This type occurs mainly on the northern and western parts; for example, some of the higher rougher inner slopes of Lyttelton Harbour from Godley Head to Coopers Knob and the steeper slopes of Mt. Herbert and Mt. Sinclair. Topdressing prospects are not good on this type because of the difficult nature of the country.
2. Stewart silt loam: This type occurs at all altitudes with rainfall varying from 35in. to 60in. Topography is moderately steep to very steep. The soil was developed under forest vegetation. This type is widely scattered on the higher slopes of the higher rainfall areas and is usually associated with type 4. A typical example may be seen on the Summit Road ½ mile from the Hilltop.

### Soils Developed from Loess

3. Bossu silt loam: This type occurs at altitudes above 1000ft. with an annual rainfall of more than 30in. Topography is easy rolling to moderately steep and the soil was developed under tussock vegetation. Examples of this type are the higher slopes leading up to Herbert Peak and the higher south-westerly tussock faces between Lake Forsyth and Timu Timu Head.
4. Summit silt loam: This type also occurs at altitudes above 1000ft. with an annual rainfall of more than 35in. and on moderately steep to steep land, and is developed under forest vegetation. This type is widespread on the upper slopes (both inner and outer) around Akaroa Harbour such as the Little River-Port Levy-Pigeon Bay higher slopes.

5a. Pawson silt loam and Akaroa silt loam: These types occur at altitudes up to 1000ft. with an annual rainfall of 35in. to 60in. and were developed under forest. The topography on which the Pawson type occurs is mostly rolling or strongly rolling with some moderately steep areas, whereas Akaroa type occurs on areas varying from moderately steep to steep and is found mainly above 400ft. Typical examples of both types are found on the lower slopes about Akaroa Harbour.

A characteristic feature of these types is the presence of a compact, relatively impermeable pan about 18in. from the surface and 18in. thick. With this pan rainfall is

Below—Pigeon Bay. The lower slopes above it are loess covered—type 5a, Pawson and Akaroa silt loams. The land rises to a volcanic escarpment, where the soil is type 2, Stewart silt loam.

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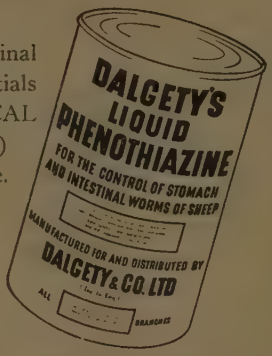


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sufficiently heavy to cause waterlogging in winter. The pan is less pronounced in the Akaroa than in the Pawson type.

5b. Pawson silt loam (dark topsoil phase): This type occurs under the same conditions as 5a except that the original vegetation was light, scrubby forest, manuka, or mountain flax. Topsoils are grey in contrast to the brown or brownish grey topsoils of 5a. The pan described in 5a also occurs in this type. A typical example occurs between the Barrys Bay dairy factory and the Old Pigeon Bay Road.

6. Takahe silt loam and Kiwi silt loam: These types were developed under tussock with an annual rainfall of less than 35in. and at altitudes below 1000ft. Takahe type occurs on easy rolling to moderately steep slopes and the Kiwi type on moderately steep to steep. The lower slopes overlooking Christchurch are typical of these types. The pan described in 5a is also present in these types, but owing to the lower rainfall winter waterlogging is less troublesome.

On the lower slopes of the Port Hills erosion by tunnelling beneath the pan readily takes place where the vegetative cover has been severely depleted.

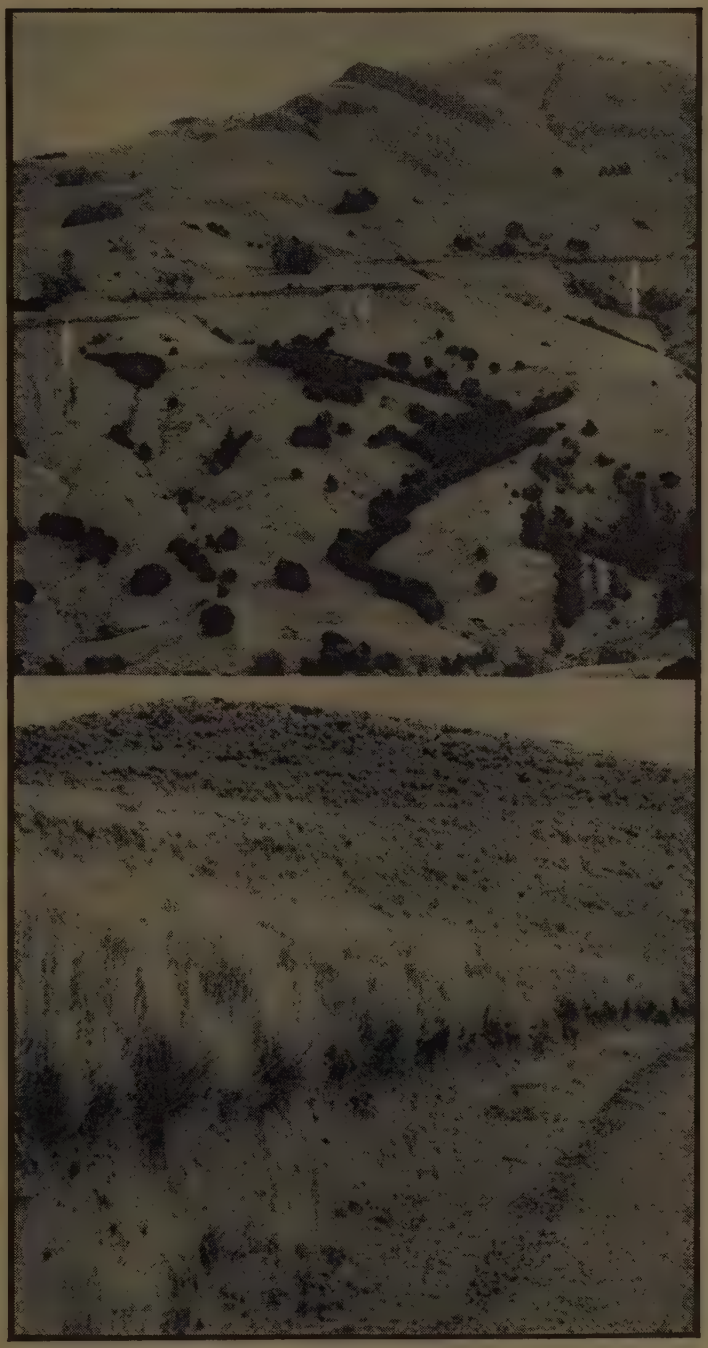
7. Barry silt loam and Wainui silt loam: These types comprise all the alluvial flats, which are of very small extent but are scattered all over the peninsula. They are formed from loess and volcanic ash materials washed down from the valley walls which surrounded them.

(Of the soil names used in this article French, Stewart, Bossu, Summit, Pawson, and Barry were used in Department of Scientific and Industrial Research Bulletin No. 65, "Soil Survey of Duvauchelle Bay-Wainui District, Banks Peninsula". Akaroa, Takahe, and Kiwi are soil names in current use in the 4 mile to the inch survey of the South Island, but are as yet restricted to Banks Peninsula and not firmly established.)

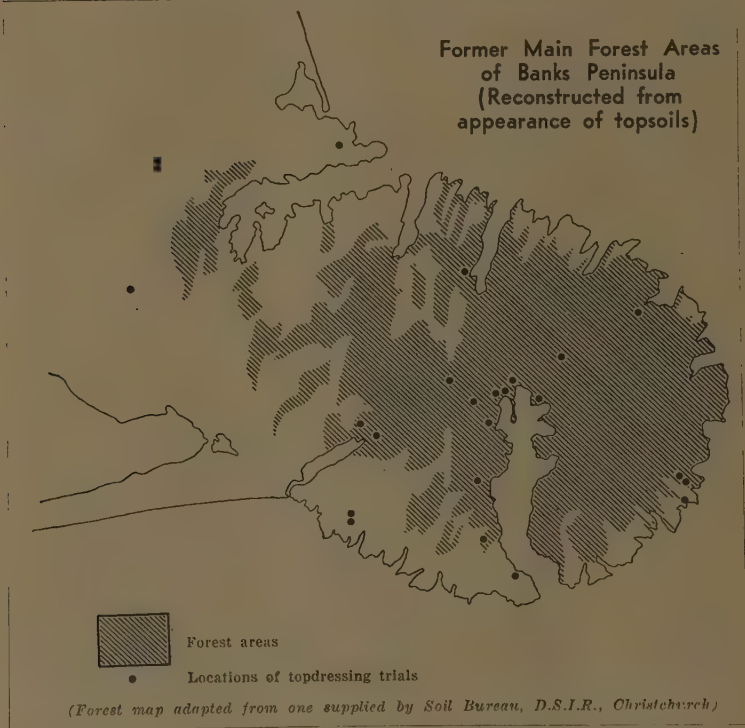
## TOPDRESSING TRIALS

The first series of observational topdressing trials laid down on Banks Peninsula was inaugurated in 1927. These trials were in progress from 1927 to 1930. At that time very little topdressing was done on Banks Peninsula and these trials were a lead to the most suitable manures for use there. The results of these trials were given in the December 1930 issue of the "Journal" (page 388). The conclusions reached from these trials require little modification at present. However, it is the intention of this article to describe the results from subsequent topdressing trials.

Five trials were laid down from 1933 to 1935; from 1938 to 1941 a further 8 trials were carried out; since 1945 another 14 trials of various types have been put down. Several of these trials were unsatisfactory experimentally and several of the earlier trials could not be classed as belonging to a particular type of soil. These results have therefore been discarded and only those which can be correlated with the soil groups as outlined earlier in this article have been included.



Upper—Barrys Bay. Soils on the lower slopes below the road (arrows) are derived from loess under scrub—type 5b, Pawson silt loam (dark topsoil phase). Above the road soils are derived from basalt under bush with totara and konini predominant—type 2, Stewart silt loam. Lower—Typical tussock cover of the higher western and southern slopes of Banks Peninsula—soil type 3, Bossu silt loam.


Former Main Forest Areas of Banks Peninsula (Reconstructed from appearance of topsoils)
Forest areas
Locations of topdressing trials

*(Forest map adapted from one supplied by Soil Bureau, D.S.I.R., Christchurch)*

The types of fertiliser used varied considerably in the different series of trials. From the practical point of view only those products which are obtainable need be considered in detail, and of these superphosphate, basic slag, and lime were the three standard products whose performances could be measured. Potash was used in some of the trials, but as it did not at any stage give a result; it can be discarded from the summary.

Of the other types of phosphate used, "Ephos" (North African rock phosphate) and "Heskett" slag gave results not as good as either superphosphate or basic slag. Serpentine superphosphate gave results very similar to superphosphate.

The quantities of the products used experimentally were:—

Superphosphate: 3cwt. each year for 3 years.

Basic slag: 3cwt. each year for 3 years.

Lime: 1 ton in the first year followed by 5cwt. each year in the second and third years.

Response in observational topdressing trials is seen in several ways:—

1. Increase in clover content of sward.

2. Increase in proportion of better grasses (for example, ryegrass and cocksfoot) to poor grasses and weeds.

3. Evidence of grazing preference by stock.

4. Improvements in colour, vigour, or density of sward.

## Recommendations

As the result of the topdressing trials which have been summarised according to soil type it is possible to recommend with some confidence the quantities and types of fertiliser for country falling within the various soil types and which has had little or no topdressing in the past. These recommendations are in per-acre dressings:—

**Type 1:** Topdressing not practicable.

**Type 2:** Basic slag, 3cwt. Maintenance dressings of lime where practicable, that is, 1 ton of lime about every 7 years.

**Type 3:** Basic slag, 3cwt., or superphosphate, 3cwt., plus lime (where practicable), 1 ton.

**Type 4:** Lime (where practicable), 1 ton plus superphosphate 3cwt: Subsequently superphosphate, 2cwt. for each of 2 more years.

**Type 5a:** As for 4.

**Type 5b:** Lime (if practicable), 2 tons over 4 years plus superphosphate 3cwt. initial dressing; plus superphosphate 2cwt. for each of 3 subsequent years. If it is not practicable to apply lime, use basic slag at 3cwt. for 3 years.

**Type 6:** On this type of country improvement in the pasture is usually necessary before topdressing becomes payable. Therefore surface sowing of subterranean clover may be necessary in conjunction with topdressing. Lime, if practicable, 1 ton initial dressing: Superphosphate, 2cwt. for each of 3 years. Subterranean clover at 3lb. to 4lb. should be sown with the initial superphosphate and lime dressing. See remarks under heading "Pelleted Clover Trials".

**Type 7:** Initial dressing, lime 1 ton and superphosphate 3cwt.; in the subsequent 2 years superphosphate at 2cwt.

Fertiliser will improve the white clover content of the sward and production from the better grasses, thereby stopping deterioration in the pasture, but to obtain best results from topdressing more attention to pasture management will be needed. Adequate subdivision is one of the main problems associated with pasture management; for instance, shady faces should be fenced off from dry faces, as they are differentially grazed by stock. The application of fertiliser is only one step toward pasture improvement and increase in carrying capacity. The control of topdressed pasture growth by stock is just as important. On large blocks, it is difficult to control grazing efficiently, but unless this is done, topdressing results may appear disappointing.

**TABLE 5—SUMMARY OF TOPDRESSING TRIAL RESULTS FROM 1933 TO 1953**

| Soils | Responses to Superphosphate | Basic slag | Superphosphate + lime | Basic slag + lime | Lime alone |
|---|---|---|---|---|---|
| Type 1 (French) | No trials | | | | |
| Type 2 (Stewart), 2 trials | 1<br>1 | 1<br>1½ | 1<br>2½ | 1<br>2½ | 0<br>0 |
| Type 3 (Bossu), 1 trial | 1½ | 2½ | 3 | 3½ | N.A. |
| Type 4 (Summit), 2 trials | 1<br>2 | 2½<br>N.A. | 4½<br>4 | 5<br>N.A. | N.A.<br>1½ |
| Type 5a (Pawson), 6 trials | 1½<br>2½<br>1½<br>2<br>3<br>2 | 2½<br>2½<br>2<br>N.A.<br>N.A.<br>N.A. | 2½<br>4½<br>3½<br>2<br>4<br>3½ | 2½<br>4<br>3<br>N.A.<br>N.A.<br>N.A. | N.A.<br>1½<br>1½<br>1<br>1<br>1 |
| Type 5b (Pawson—dark topsoil phase), 3 trials | 2<br>2<br>2½ | N.A.<br>N.A.<br>3 | 3½<br>3½<br>5 | N.A.<br>N.A.<br>4 | 1<br>1<br>½ |
| Type 6 (Takahe) 3 trials | 3<br>3<br>3 | 2½<br>3<br>N.A. | 4½<br>3½<br>2½ | N.A.<br>N.A.<br>N.A. | 1<br>1<br>½ |
| Type 7 (Wainui), 1 trial | 1 | 3 | 3 | 3½ | N.A. |

Marking: 1 = slight response; 2 = fair response; 3 = good response; 4 = very good response; 5 = excellent response; N.A. = not applied.

Topdressing trial at Duvauchelle. Upper—No manure: Rough growth, browntop, danthonia, and flat weeds. Lower—Lime 1½ tons per acre and superphosphate 3cwt.: Closely grazed; abundant white clover and perennial ryegrass.

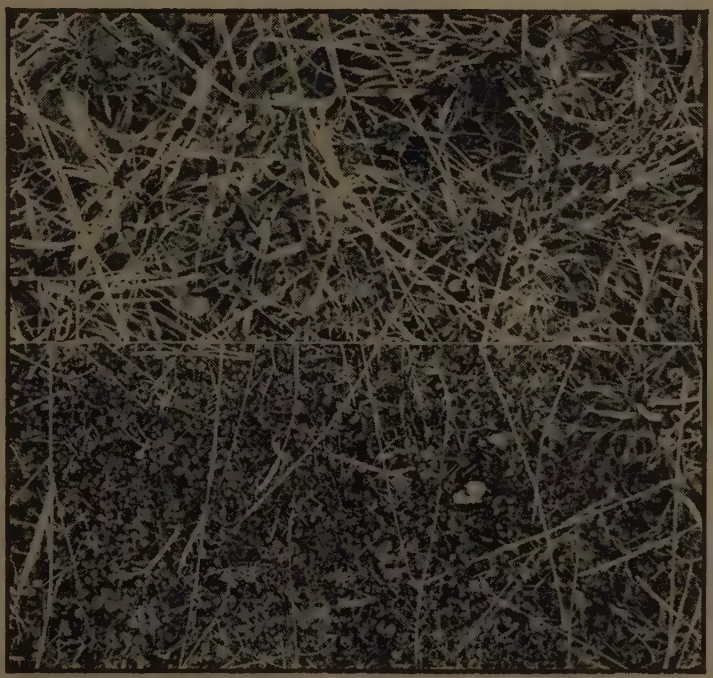
## Other Forms of Phosphatic Fertiliser

In three trials, the first of which was started in 1946, experimental quantities of various types of phosphate produced by the Tennessee Valley Authority (T.V.A.) in the U.S.A. were compared with superphosphate. Some of these are more highly concentrated forms of phosphate, containing up to two or three times as much phosphorus per unit of weight as ordinary superphosphate or basic slag. In addition experimental quantities of different types of phosphate not containing sulphur have been prepared by officers of the Department of Agriculture's Soil Research Station, Rukuhia.

The result of these trials has been that per unit of phosphorus all of these phosphates from the T.V.A. have given results as good as or even better than superphosphate. Some of the Rukuhia experimental phosphates were also as good as superphosphate. The use of the more concentrated phosphates has some real advantages on Banks Peninsula where application and transport charges are high, provided always that price per unit applied on the pastures is competitive with other available phosphates.

## Molybdenum

Molybdenum was applied alone and with phosphate in 7 trials. The areas for the trials were selected as those which would be the most likely of peninsula soils and pastures to respond, such as pastures deficient in clover.



T.V.A. phosphate trial at Paua Bay. Upper—No manure: Flat weeds and rough growth of danthonia and browntop. Lower—"Metaphos" 1½cwt. per acre for 1 year: Dominant white clover.

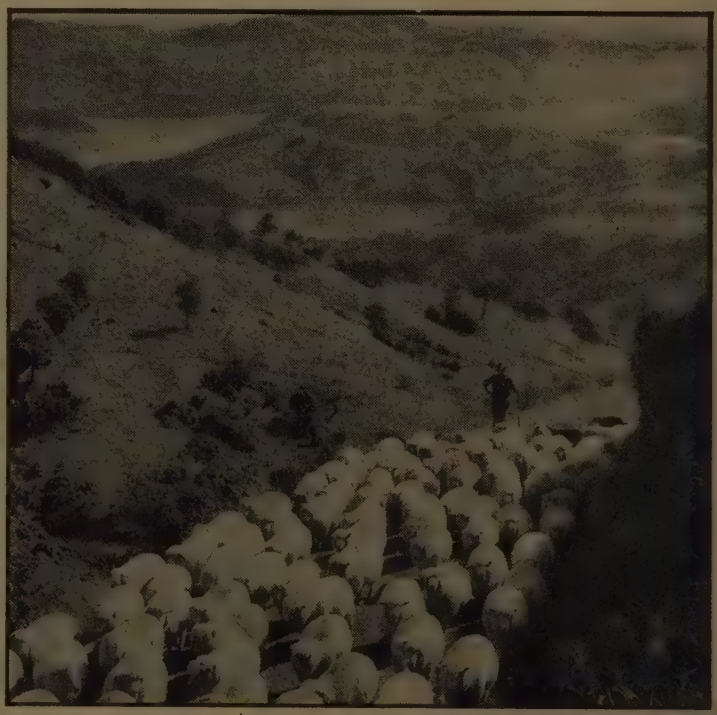
Results of surface sowing of subterranean clover at Paua Bay. Upper—Sward before oversowing: Rough growth of browntop, danthonia, and dogstail. Lower—Subterranean clover sown and later topdressed with basic slag at 3cwt. per acre: Vigorous plants of the clover with large leaves.

Trials have been located on soil groups 3, 5a, 5b, and 6. One of these trials on group 3 (Bossu silt loam) showed a response to molybdenum alone and to molybdenum with superphosphate compared with superphosphate alone. Another trial in group 6 (Takahe silt loam) showed no response to molybdenum alone, but gave a response to molybdenum with superphosphate over and above the response to superphosphate alone, though the best plot in that trial was that with lime and superphosphate. No responses to molybdenum have been observed, and appear unlikely, on the other trials, though it is too early to indicate if there has been a response on group 5b.

Clover-deficient pastures on soil groups 3 and 6 may be a result of molybdenum deficiency. If molybdenum dressings are tried, the molybdenum should be applied as molybdenum superphosphate, but not more frequently than once in every 3 years. In the intervening period ordinary superphosphate should be used.

## Pelleted Clover Trials

Four trials have been conducted on Banks Peninsula to test the efficacy of enclosing clover seeds in pellets containing fertilising materials for surface sowing on areas where it is desired to introduce clovers. These trials were on country receiving less than 35in. of rain per annum where the pastures showed little evidence of clover growth other than that of suckling clover. All trials were on group 6 soil type except one on group 5a. The evidence from these trials indicated that present methods



[*National Publicity*

Two-tooth Romney ewes on an Akaroa farm. On Banks Peninsula the Romney is dominant to a much greater extent than in other areas of Canterbury.

of pelleting seeds for surface sowing give no advantage over the same seeds not pelleted.

However, the trials were of considerable value in demonstrating several facts of use to farmers on the peninsula who want information on surface sowing on the drier parts:—

1. In three of the four trials subterranean clover was established successfully by surface sowing at 3lb. to the acre. Superphosphate at 2cwt. per acre was sown with the seed.

2. For the best results with surface sowing the ground should not be practically bare of cover; the comparative (but not complete) failure of one of the four trials was due to sparse cover; seedlings which germinated were burnt off or eaten by birds. A certain amount of cover (up to 3in. of growth) allows satisfactory establishment.

3. White clover failed to establish satisfactorily in any of these trials. This does not necessarily condemn altogether the use of white clover for surface sowing under these conditions, but it is obviously much harder to establish than is subterranean clover under these circumstances.

4. To establish subterranean clover successfully it is necessary to close the area from stock from about October to December or January in the spring and summer immediately after the autumn sowing. This is essential to allow full reseeding of the first established subterranean clover plants.

The soil type in which the introduction of clover is generally likely to be necessary and desirable is type 6. In all the others (with the probable exception of type 1) clovers can be encouraged by topdressing alone.

## Future of Topdressing

To give an impression of the degree in which fertilisers and lime are used on Banks Peninsula the figures of rail deliveries to Little River railway station are shown in Table 6.

TABLE 6—RAIL DELIVERIES OF FERTILISER AND LIME TO LITTLE RIVER

| Year ended 31 March | Fertiliser | Lime |
|---|---|---|
| | tons | tons |
| 1928 .. .. .. | 146 | 12 |
| 1929 .. .. .. | 168 | 52 |
| 1930 .. .. .. | 159 | 88 |
| 1931 .. .. .. | — | 292 |
| 1932 .. .. .. | 196 | 158 |
| 1933 .. .. .. | 178 | 186 |
| 1934 .. .. .. | 184 | 209 |
| 1935 .. .. .. | 180 | 251 |
| 1936 .. .. .. | 205 | 261 |
| 1937 .. .. .. | 296 | 378 |
| 1938 .. .. .. | 448 | 696 |
| 1939 .. .. .. | 320 | 645 |
| 1940 .. .. .. | 438 | 773 |
| 1941 .. .. .. | 453 | 1,107 |
| 1942 .. .. .. | 358 | 1,351 |
| 1943 .. .. .. | 257 | 1,179 |
| 1944 .. .. .. | 243 | 1,266 |
| 1945 .. .. .. | 376 | 1,687 |
| 1946 .. .. .. | 300 | 1,102 |
| 1947 .. .. .. | 242 | 1,279 |
| 1948 .. .. .. | 340 | 1,883 |
| 1949 .. .. .. | 313 | 1,960 |
| 1950 .. .. .. | 667 | 2,691 |
| 1951 .. .. .. | 414 | 2,256 |
| 1952 .. .. .. | 505 | 1,047 |
| 1953 .. .. .. | 272 | 2,158 |

A factor now favouring the increasing use of fertilisers on Banks Peninsula is aerial topdressing. The first commercial application by air was in 1949. The method has obvious advantages on country much of which is otherwise somewhat inaccessible. Though until 1953 little topdressing could be carried out by air owing to lack of suitable landing strips, considerable progress has been made since. The formation of a number of strips has greatly increased the area of country capable of being topdressed from the air. If the present progress continues through the co-operative effort of farmers, it would appear that a very large proportion of the peninsula could be topdressed by air.

Liming is still restricted in amounts applied on hill country because of difficulties in application, but despite this lime is being used in increased quantities wherever it is possible to apply it.

The use of concentrated forms of phosphatic fertilisers has been dealt with in relation to trial results. If these more concentrated types of phosphate were available, they would have very obvious advantages for use on the peninsula, where cartage charges form a large part of topdressing costs, and in aerial topdressing, where a reduction in bulk would save costs. This type of phosphate would have to be available at a competitive price per unit of phosphate as applied on the land before it could be expected to replace established types of fertiliser.

Over the past 100 years Banks Peninsula has been farmed on the strength of its original fertility. It is now becoming apparent that a slow decline in the natural productivity of the soil is occurring. This tendency can be counteracted only by increased use of fertilisers and lime and by improved management. Much country the topdressing of which had been regarded as impracticable is capable of considerable improvement now that facilities such as aerial topdressing or blower-type topdressers are available.

**Acknowledgment**

Acknowledgment is made to C. S. Harris, formerly of the Soil Bureau, Department of Scientific and Industrial Research, Christchurch, for the information on soils.

# Regrassing after Flood Silting in Poverty Bay

FLOOD-SILTED pastures in Poverty Bay can be successfully regrassed if certain basic principles are observed. The first of these is the recognition of the type of sediment deposited. Roughly this can be divided into three classes: Heavy sediment, found where water has ponded; medium sediment, found fairly close to the river; and light sediment, found beside the river.

Heavy sediment has a flat and smooth surface and feels smooth or greasy; medium sediment looks ruffled on the surface and has a slightly gritty feeling; and the sandy, light sediment feels gritty and is usually forced into waves or a rolling formation by the retreating waters. Light sediments, which are free draining, can and should be cultivated as soon as the flood water has receded, but with medium and heavy sediments this is usually impossible for some considerable time. On these it is possible to obtain a good strike without cultivation, provided the seed is sown before the surface dries out and loses its stickiness.

The time for successful sowing is usually short and therefore the importance of the recognition of the sediment types must be emphasised. If a farmer has all three types on his land, he should sow his medium silt first, then the heavy, and finally the light to catch each in its most receptive state.

## When and What to Sow

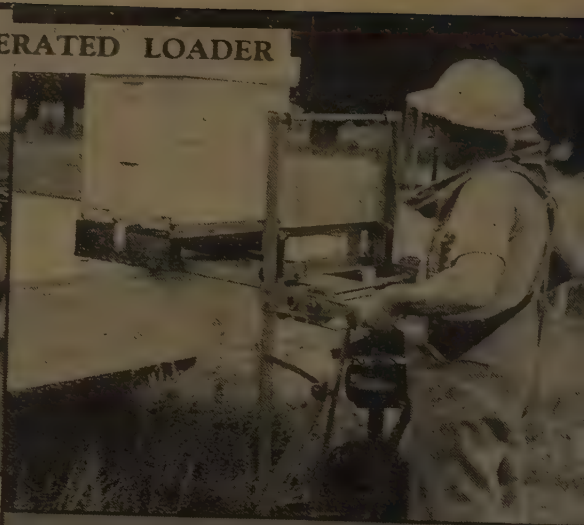
If only small areas are affected with medium and heavy silt, it is better to leave the regrassing until the soil can be ploughed and worked and put into crop in preparation for autumn sowing in the usual way. Where possible ploughing should be deep enough to bring up some of the underlying soil. Oversowing is not worth while on light sediments beside the river, as these dry out rapidly. Cultivation should be done after surface irregularities have been graded out, the aim being to mix the raw sediment with the underlying soil.

If the flood occurs before June, a pasture sowing can be made with standard mixtures as soon as the land is ready. After July, however, a crop should be taken in preparation for sowing to pasture in autumn. Heavy and medium silts must be sown when the waters have subsided and while the surface is still sloppy. Too deep a covering of water rots the seed and carries away the lighter sorts. Once the surface has even slightly caked, bird depredation will be heavy and germination of the remaining seed will be poor. Air sowing is the only way in which to sow large areas in the limited time available.

The recommended grass mixture per acre is Italian or short-rotation ryegrass 15lb., perennial ryegrass 15lb., cowgrass 4lb., and white clover 2lb. The persistency of Italian or short-rotation ryegrass will depend largely on the grazing management, but its inclusion is essential to gain a quick cover to prevent the soil surface from drying out and cracking before the slower growing perennial ryegrass and clovers have established. Manuring should be at the rate of 2cwt. of superphosphate and 2cwt. of sulphate of ammonia per acre. The sulphate of ammonia, though expensive, is necessary for quick establishment, new sediment being almost completely lacking in available nitrogen.

—*H. de O. CHAMBERLAIN,*
*Instructor in Agriculture,*
*Department of Agriculture,*
*Gisborne*

# HAND-OPERATED LOADER



Upper left—The machine being used to remove honey supers while the brood nest is examined for swarm and disease control. Upper right—Loading a hive on to a truck. Middle left—The machine in position for lifting top supers. Lower right—Front view of the loader. Lower left—Placing a bee escape above the queen excluder while honey supers are automatically held in position.

# Two Mechanical Hive Loaders

IN recent years an increasing number of mechanical devices have been made to eliminate some of the heavy lifting that is necessary in beekeeping. In this article two mechanical hive loaders designed by beekeepers are described.

## HAND-OPERATED LOADER

THE mechanical hive lifter described below by F. A. Bartrum, Apiary Instructor, Department of Agriculture, Christchurch, was devised by Mr. E. B. Diehl, Waiau, because of the difficulty in obtaining labour to assist in removing apiaries to new locations. Some beekeepers with these machines, which are now being extensively used throughout Canterbury, have found so many additional uses for them that they seldom visit an apiary without them.

To enable apiaries to be worked efficiently with this machine hives have to be arranged in such a position that access is readily available. All types of bottom boards are adaptable to the machine except those with attached 3in. x 2in. timber running lengthwise. One of the most efficient types of bottom boards and the one most adaptable to the loader is that in the illustrations with the 3in. x 2in. running crosswise.

### Large Apiaries Shifted

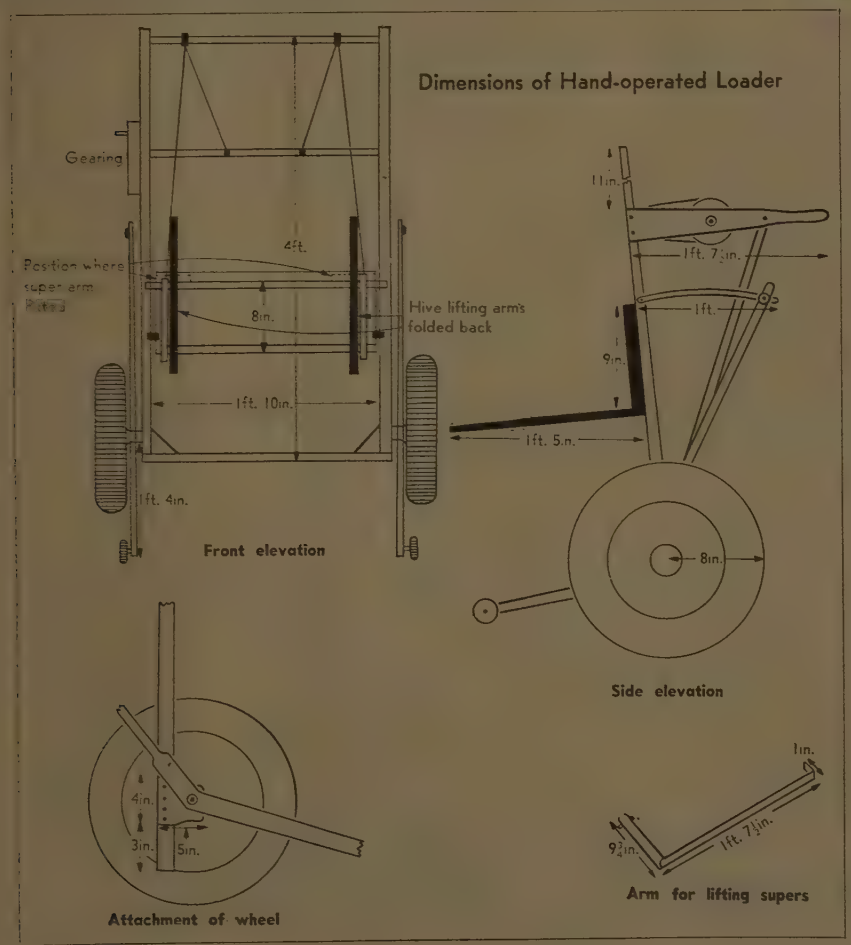
With this machine large apiaries can be shifted by one man in a comparatively short time. A hive is lifted on to a truck by placing the front forks of the machine underneath the bottom board and the two front runners are adjusted if the ground is uneven so that the hive is lifted evenly. The hive is then wound clear of the ground and is held in position by an automatic brake while it is wheeled to the truck. When the hive has been wound up above the level of the truck deck the machine is wheeled forward and the automatic brake is released to let the hive down gently. Sliding the hive into the required position is then simple.

A convenient way of carrying the hand-operated loader on the back of a truck.

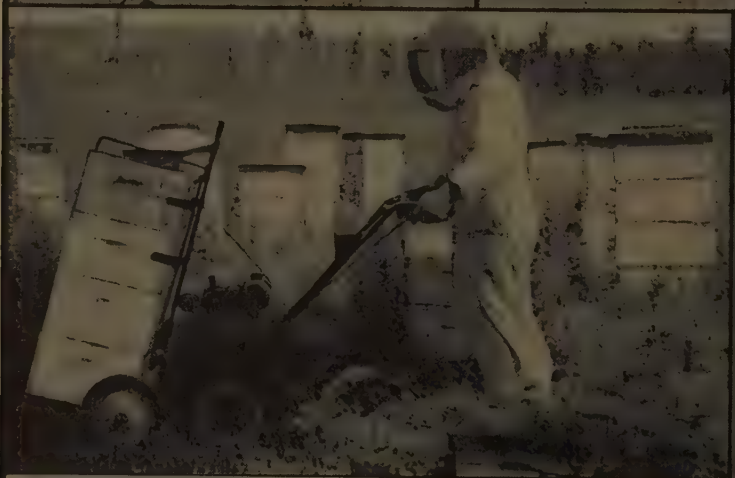
By the addition of two removable arms this loader can be adapted to a number of other uses in the apiary. When the arms are in use the two forks for lifting hives are folded back against the machine.

The loader is ideal for placing bee escapes in position, as it eliminates the heavy lifting in removing and replacing the honey supers. Sufficient space for a bee escape to be placed over the top of a queen excluder can be obtained by placing the two arms around the supers that require taking off and winding them up 3in. or 4in. The automatic brake is then released and the supers are lowered into position. Large apiaries can be fitted with escape boards in this way in a comparatively short time with little or no disturbance of the bees. Provided the ground is reasonably level, honey above the bee escapes can be taken off the hive with this machine and wheeled directly to the truck. Some beekeepers wheel as many as three supers of honey at once without difficulty.

Some beekeepers have used the machine to remove honey supers to allow an examination of the brood nest for swarm and disease control.



# POWER-DRIVEN LOADER



Upper left—The loader with the control lever down. Upper right—The control lever in the raised position. Middle left—A load of four supers ready to be driven to the truck. Lower left—The tail board of a truck used as a ramp for the loader. Lower right—The loader being driven on to the truck for the supers to be unloaded.

### Removal of Bottom Brood Boxes

Many beekeepers allow the bottom brood boxes to remain on hives until the combs and bees have deteriorated so much that they are of no further use, but some beekeepers with these machines have devised a system whereby the bottom brood boxes are removed each season. To enable them to do this hives are wintered down in three boxes. When the bees leave the bottom box in autumn the occupied top supers are wound up by use of the machine and the bottom box is then removed. This method ensures a constant circulation of boxes whereby all old combs may be melted down and the boxes renovated.

## POWER-DRIVEN LOADER

An ordinary 1 h.p. garden tractor forms the basic equipment in the mechanical loader described below by R. Goddard, Apiary Instructor, Department of Agriculture, Tauranga. However, the tractor is fitted with a heavy duty reduction gear to the driving wheels and this enables heavy loads to be carried. The loader was designed by Mr. G. Corlett, Tauranga.

The loading attachment, shown in the illustrations opposite, is constructed of 2in. x ⅜in. steel and is a manually operated fork lift fixed rigidly to the tractor by means of a 9in. steel pin at the bottom and a bolted stay at the top. The front wheels of the attachment are offset 6in. from the front axle. When the control handle is raised the front axle revolves a quarter turn and the wheels go down and back, bringing the centre of the load over the wheels and at the same time lifting the load sufficiently to clear the ground by about 6in.

### Fast Loading and Stacking

The machine is used mainly for loading supers of honey, but it can also be used with equal success in the shifting of hives or the carrying of empty combs in supers. During the latter part of the honey season the bees are somewhat vicious when the hives are worked and robbing may become a nuisance. At this time of year most beekeepers endeavour to carry out apiary work with all possible speed and to leave the apiary before the bees become unduly troublesome. With this machine the operator loaded and stacked 40 heavy supers of honey scattered throughout the yard on to the truck in 12 minutes.

The honey is taken off the hives in the ordinary way and the supers are stacked four high on wooden platforms placed at intervals throughout the yard. On these platforms a drip tray is placed to prevent honey leaking over the floor of the truck. Usually all honey ready for extraction is taken off the hives before loading begins, and if robbing is prevalent, gauze screens are placed over each stack of supers.

### Method of Loading

As the truck sides are 3ft. high, the supers can be loaded in piles of four. The tail-board, which is easily removable, is used as a ramp for running the tractor on to the floor of the truck and it is admirably suited to this purpose. When the operator is ready to load the supers of honey the tractor is started and driven into position as shown in the illustration opposite, and the loading attachment, which resembles the ordinary honey house bogie, is pushed under the pile of supers. The operator raises the control handle, and the load is lifted clear of the ground. A ½in. rod hinged at the back of the appliance springs forward and catches the two top supers and this prevents the load falling forward no matter how uneven the ground. The tractor is driven to the truck and up the ramp, and the four supers are deposited in their correct position with no further handling required.

With this machine all the extremely heavy work involved in carrying supers of honey from the hive to the truck, lifting them to the decking, and restacking them is eliminated. The machine helps to make the task of removing honey from the hives more pleasant, as no undue strain is placed on the beekeeper. Breakages of new combs heavy with honey do not occur as in manual loading, where supers are often dropped heavily to the floor of the truck.

### Easy Mowing of Grass

The problem of keeping grass under control in an out apiary has always caused beekeepers concern, but a sickle-bar mower can be fitted to the tractor and all the grass mowed close to ground level. It takes about 5 minutes to remove the lifting apparatus.

The tractor is easily steered even when carrying a heavy load, as all the weight is carried over the two front wheels. Lifting the handles of the machine causes the tractor wheels to leave the ground and enables quick manoeuvrability.

---

# A Leveller for Irrigated Areas

**IRRIGATORS who have contemplated assembling a machine capable of efficiently taking the humps and hollows out of irrigated areas will find the machine illustrated is very useful, particularly on areas where levelling will allow more efficient use of a minimum of available water, permitting a greater spread and less back-breaking work with shovels. Additionally this machine can level to a state suitable for border diking, provided a minimum of dumping is required.**

THE initial cost is low—on present values about £60. The over-all measurement of the leveller is 20ft. x 8ft.; the ironshod runners are 20ft. x 14in. x 4½in.; the grading beam centred between the runners measures 7ft. x 11in. x 2½in., and to it is attached a steel blade which is 4in. x ½in. and which extends 1in. beyond the beam as the levelling medium. The crossed support beams are 4in. x 2in. and the two end spacers are 6in. x 2in. To overcome any strain on the depth-control levers two movable plates, which can be tightened once the position of the blade is set, are set in behind the grading beam, one on each side.

This machine, which can be pulled by any tractor of 26 or more rated drawbar horsepower, has certain faults owing to its rigidity. As it is inclined to ride obstacles like strikeouts, to increase its efficiency high strikeouts could be ploughed out; conversely finishes could be ploughed in. Further, it is inclined to ride on one side or the other, which is the reason for the bags of earth on the frame of the leveller illustrated.

As constructed this leveller has no cutting blade and is inclined to drag the material forward as it goes. However, if the steel blade were angled forward it would give this cutting edge and would possibly overcome the tendency to ride. A further improvement would be an articulated type of leveller to overcome the heavy drag on turning. As three seasons' work with it has already been done and land has been prepared for border diking, there is no doubt a machine modelled o nthese lines could play an effective part in the more efficient utilisation of water.

—*R. C. SCHOFIELD,*
*Instructor in Agriculture,*
*Department of Agriculture.*
*Alexandra*

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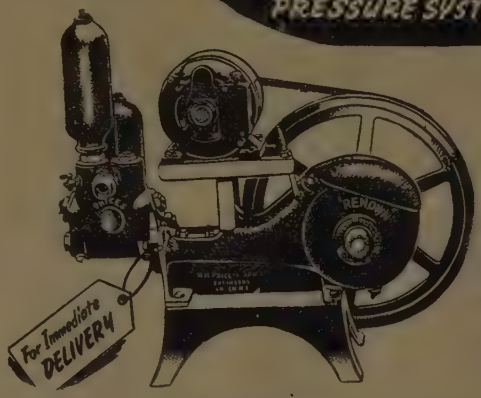


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# New Labour-saving Silage Machine

By D. F. SCOTT, Machinery Instructor, Department of Agriculture, Auckland

OVER the past season a number of farmers in the Auckland Province have watched with interest demonstrations of a new machine for handling silage. The harvester embodies two well-known English machines which are combined to provide a method of cutting grass, lacerating it, and elevating it into the conventional forage harvester type of trailer or a truck.

THE two machines are a rotary mower which in a small model is commonly used as a domestic lawn-mower but which in this case is fitted with two cutters and a pick-up elevator which has been used in England for a number of years with the aim of making better silage. The pick-up elevator has a very heavy fan which, as well as picking up the material and delivering it to the truck or trailer, lacerates it as it passes through. This combination gives a much simpler and cheaper forage harvester.

In the past forage harvesters have been considered to be more the machine for large farms where great acreages of silage are made each year, but this machine is claimed to bring the forage harvester within the means of most dairy farmers who make silage.

The rotary mower is very simple and has much less mechanism to go wrong than the normal sickle-bar mower. It consists of two square alloy plates which rotate in opposite directions parallel with the ground. At each corner of the squares is fitted a conventional plain mower knife section. These cost less than a shilling each, so the replaceable parts of the cutting mechanism of the machine are valued at less than 8s.

In operation these two rotating cutters cut the grass to a width of 4ft. 3in. The rotary motion of the cutting blades and the fact that they are rotating in opposite directions tend to throw the cut grass into a narrow windrow on to a shoe that lies between the two cutting blades. The intake of the fan is situated behind the cutting mechanism and is arranged so that it will pick up this single windrow. Thus the feed is partly by suction, as in a vacuum cleaner, and partly by force from the cutting blades. Because of this arrangement it is possible to feed through the

Right: Top and upper middle—The machine harvesting a crop of autumn silage. The material is being blown into a specially built trailer towed behind the machine. Lower middle and bottom—Lucerne being harvested at a demonstration in which the crop was blown into a truck running alongside the machine. The extra sides of the truck are all that is required to prevent the material from being blown off the truck. Photo Craft photos.

machine surprisingly heavy crops of lucerne, grass, oats, peas, maize, and even chou moellier.

## Simple Mechanism

The mechanism of the machine is very simple. It consists of V belts which transfer the drive from the power take-off shaft to the various parts of the machine. The machine can be used in a stationary role or, as is usual, towed round the paddock mowing and loading the silage material into the trailer or truck as it goes.

If desired, the pick-up elevator part of the machine can be removed and it then becomes a rotary mower which can be used for topping at high speeds and which is also useful for all the jobs usually done by a conventional mower. A farmer who plans to buy a new mower could profitably make use of this fact.

The machine is towed and powered by any medium or larger horsepower tractor. The silage trailer can be attached to the side of the elevator and towed by the one tractor while loading is in progress or a separate tractor and trailer unit or even a motor truck can be driven alongside the elevator to receive the material blown from its spout.

The makers of the machine claim that it enables better silage to be made with low labour requirements and with a minimum of traffic over the harvested paddock. There is no doubt that traffic close to a large pit is very intensive and damages the sward materially. It is suggested that a paddock harvested by the machine would recover much more quickly than one subjected to continued running backward and forward with some other means of harvesting for silage.

Silage made by the machine differs from ordinary forage harvester silage in that it is not chopped, so it is more easily built into stacks or clamps. The bruising that the material is subjected to seems to make it easier to handle when it comes time to feed out. The silage is not tangled and is generally easier to fork, though it is still necessary to cut the stack, mainly for the sake of neatness to prevent waste. The machine, as well as being used for the making of silage, is put to quite a number of other uses in England.

## Pasture Topping and Other Uses

Topping of pastures normally leaves the cut material on the ground, where, though some may be eaten by stock, most is wasted. With this machine the cut material can be conserved as silage with very little extra trouble and expense. Even with hay, cutting the grass with this machine and passing it out through the machine to be blown back on to the ground has the effect of loosening up the windrow, which is exposed to wind for quick drying.

The machine is also useful for making all types of silage not only from grass and lucerne, but from maize or chou moellier, and in England it is used for spreading straw behind header harvesters and for pulping roots.

A trial was carried out using the machine to cut a load of chou moellier for immediate feeding to cows. Normally this is a tedious job that requires much labour. In the trial it was found that the machine cut the chou moellier perfectly. However, it broke the stalks to such an extent that there was some wastage because of the very small particles. It is felt that by varying the speed of the fan this could be largely reduced and thus the machine could probably be used to handle chou moellier for immediate feeding out as well as for ensiling.

## Advantages

The machine shows up to best advantage where silage is being stored in a central point and cut in remote paddocks; in other words, where cartage distance is long. The machine has been used near Auckland to cut silage on two farms for cartage to a third. Previously this job was done with a normal green crop loader and truck. It involved mowing, which requires one man, and loading the truck, which requires two men; with the driver this was a total of four men. With this machine one man drove the tractor, which mowed, bruised, and loaded the truck driven by another man, a total of only two. The silage made in this case was considerably easier to feed out than the long, tangled material that resulted from the handling by the green crop loader and the men on the truck.

Normally the machine can handle approximately an acre of silage per hour and when it is used with a tip trailer attached behind silage can become a one-man job, especially if the material is going into a pit.

The height of cut of the machine can be varied from 1in. to 8in. and it performs much better with short grass than the conventional sickle-bar mower. This is an advantage, as it means that silage can be made from any surplus grass growth, though it may be only a few inches high. Pasture can be cut at the short, leafy stage when a buckrake or silage sweep would have difficulty in handling the cut material and the rotary mower can satisfactorily cut anything from short grass to light scrub at a high speed and with very little maintenance to cutting parts.

## Methods of Storing Grass

Probably the ideal method for storing grass harvested with this machine is the pit, where the material can be tipped in, either from a lorry or trailer, and requires very little spreading by fork. It is possible, however, to build stacks or clamps, and silage made with this machine can be stacked without the aid of any support or wire netting, as is often used for chopped silage. It is also possible to build a wedge by backing the tip truck up on to the stack as it is being built. Under exceptionally moist conditions no doubt this would be difficult, but in the past season it was quite practicable.

The cost of the machine, though greater than that of the buckrake, is considerably below the cost of a normal forage harvester. However, for the purchase of one of these machines to be worth while a farmer would need to make a considerable area of silage, say, 30 or 40 acres.

The machine definitely offers a means of making silage under a wide range of conditions with different crops and a low labour requirement and avoids continuous running backward and forward over paddocks with machinery. It is a versatile machine, and where large areas of grass are ensiled and particularly where long cartage is required it is an attractive proposition.

# A. and P. Show Dates

THE following are dates and venues of A. and P. shows to the end of January.

### NORTH ISLAND

**October**

*15 and 16 October—Poverty Bay A. and P. at Gisborne.
*20 and 21 October—Hawkes Bay A. and P. at Hastings.
28, 29, and 30 October—Waikato A. and P. at Hamilton.
*29 and 30 October—Wairarapa and East Coast A. and P. at Carterton.

**November**

*4, 5, and 6 November—Manawatu and West Coast A. and P. at Palmerston North (Royal Show).
12 and 13 November—Wanganui A. and P. at Wanganui.
*12 and 13 November—Whangarei A. and P. at Whangarei.
*17 November—Thames Valley A., P., and H. at Te Aroha.
19 and 20 November—Egmont A. and P. at Hawera.
20 November—Bay of Islands P. and I. at Waimate North.
20 November—Waihi A. and P. at Waihi.
*25, 26, and 27 November—Auckland A. and P. at Auckland.
26 and 27 November—Stratford A. and P. at Stratford.
27 November—Kaikohe A., P., and H. at Kaikohe.

**December**

*4 December—Hauraki A. and P. at Paeroa.

**January**

*7 and 8 January—Rotorua A. and P. at Rotorua.
14 and 15 January—Wairoa County A. and P. at Wairoa.
*15 January—Marton District A. and P. at Marton.
*22 January—Central Hawkes Bay A. and P. at Waipukurau.
*25 and 26 January—Feilding I., A., and P. at Feilding.
29 January—North Kaipara A. and P. at Paparoa.

### SOUTH ISLAND

**October**

16 October—Ellesmere A. and P. at Leeston.
23 October—Northern A. and P. at Rangiora.
29 and 30 October—Marlborough A. and P. at Blenheim.
30 October—Timaru A. and P. at Timaru.
30 October—Amberley A. and P. at Amberley.

**November**

*4 November—Ashburton A. and P. at Ashburton.
*10, 11, and 12 November—Canterbury A. and P. at Christchurch.
17 November—North Otago A. and P. at Oamaru.
19 and 20 November—Nelson A. and P. at Richmond.
20 November—Courtenay A. and P. at Kirwee.
*20 November—Waimate A. and P. at Waimate.
20 November—Taieri A. and P. at Owtram.
27 November—Motueka A. and P. at Motueka.
27 November—West Otago A. and P. at Kelso.

**December**

4 December—Tokomairiro A. and P. at Milton.
*7 and 8 December—Gore A. and P. at Gore.
11 December—Wyndham A. and P. at Wyndham.

**January**

8 January—Blueskin A. and P. at Waitate.
22 January—Palmerston and Waihemo A. and P. at Palmerston.
29 January—Walau A. and P. at Tuatapere.

* The Department of Agriculture exhibit will be staged at this show.

# Perching Pullets for the Household Poultry Keeper

THE choice of perching pullets in preference to day-old chicks by household poultry keepers is often a wise one. Though the cost is considerably higher for perching pullets 8 to 10 weeks of age, they often prove cheaper than chicks when the cost of each of these successfully reared to the pullet stage is calculated. In this article H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, discusses the advantages for the household poultry keeper of buying perching pullets and the points to be watched when purchasing them.

*[Green and Hahn*

Household poultry keepers will find perching pullets satisfactory for replacement stock.

DAY-OLD chicks, brooded artificially or naturally, require considerable attention. For various reasons this may not always be possible, with the result that the chickens are chilled or checked, resulting in adult birds of poor size and stamina. Makeshift brooders, sheds, and other equipment make chick rearing hazardous and expensive. Poor sheds with damp earthen floors are an enticement to rats and other vermin, beside encouraging such diseases as coccidiosis and roundworms.

Consequently it is little wonder that so many small poultry keepers have found it much more convenient and inexpensive to purchase older pullets from a reputable breeder. If perching pullets are given reasonable attention, the chances of losing them from vermin or disease are comparatively small. Diseases such as pullorum usually occur in the first few days and caecal coccidiosis is usually found at approximately 3 weeks of age. Both of these diseases can be avoided through sound management.

*[Niederer*

Dry mash fed in a hopper to growing stock keeps supplies of food constantly before the birds and may help to avoid outbreaks of cannibalism.

Coccidiosis in particular is regarded as a management disease resulting from overcrowding or through allowing the chickens to run on damp litter or green concrete.

## Selecting Pullets

When perching pullets are being selected care should be taken to ensure that they are good specimens of the breeds required. Heavy breeds or crossbreeds should be even in size and fully feathered. Slow feathering in chickens is not generally a good sign and often indicates lack of stamina. However, some breeds, for example, the Rhode Island Red, are notorious for slow feathering and some latitude should be allowed accordingly. Ten-weeks-old pullets should, in addition to being well feathered, have a bright appearance about the head. The eyes should be bold and clear, indicating that the chicken is in good health.

Chickens that have dull eyes and are light in condition and have that "tucked up" appearance are either culls or infested with roundworms. As a precaution against the latter it is wise to dose all chickens at 10 to 12 weeks of age with carbon tetrachloride. This drug can be procured in capsule form and should be administered at the rate of 1 c.c. per chicken. When approximately 18 weeks old the birds should receive 2 c.c. of carbon tetrachloride as a final precaution against roundworms. There is also available now a worm powder which can be fed in the mash. The manufacturers' instructions on the tin should be followed carefully. Neglecting to dose chickens for worms will not only retard their growth, but may cause an outbreak of duodenal coccidiosis.

## Feeding

There are several satisfactory ways of feeding perching pullets, but the majority of household poultry keepers still prefer to feed wet, crumbly mash in the morning with two feeds of grain during the day. Dry mash in a hopper is also satisfactory and has the advantage of keeping the birds occupied, thus possibly avoiding an outbreak of cannibalism. The addition of 8 per cent. of milk powder by weight to the mash will provide the birds with more protein and promote growth and stamina. Pellets can be used in place of or in addition to mash with confidence.

## Greenfeed

A good supply of succulent greenfeed should be available whenever possible. Where this is difficult vitamin A in the form of a high-grade fish oil can be used quite satisfactorily. The amount of oil necessary for 10-weeks-old birds would be approximately 3 tablespoons to every 10lb. of mash. Some mash manufacturers are incorporating a synthetic vitamin A powder in their products, making the addition of oil unnecessary.

## Ordering Pullets

It is most important to order perching pullets well ahead of the delivery date. The demand for chickens has increased considerably and to avoid disappointment the order should be placed at least 3 months before the chickens are required. Otherwise late-hatched chickens may have to be taken instead of birds hatched at a more suitable time, such as mid-August.

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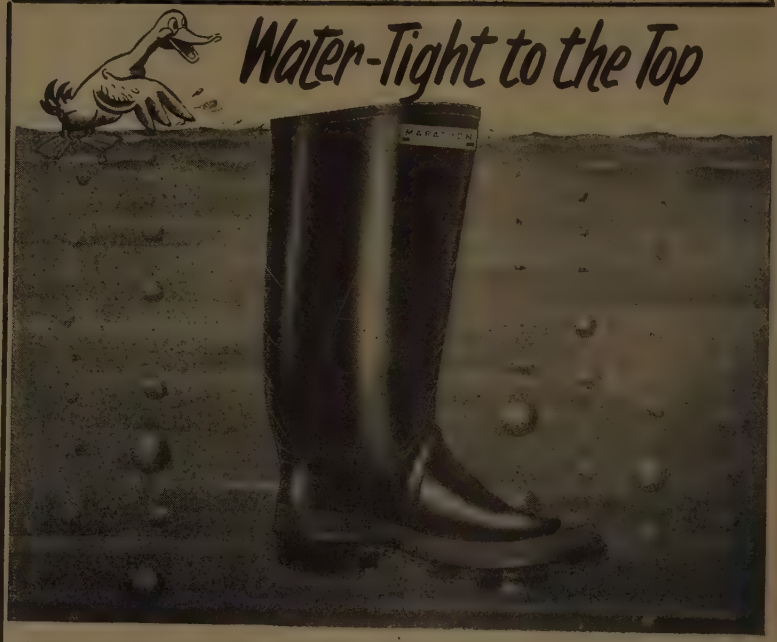


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**POTATOES AND SWEDES**

IN trials with potatoes T.C.A. gave effective control of grasses and redroot (*Amaranthus retro-flexus*); the water-based preparations of M.C.P. gave control of the broad-leaved weeds present, and C.M.U. gave control of all weeds present. Damage resulted only through the use of oil-based esters of 2,4-D applied at the post-emergence stage. Two trials conducted on swedes showed that excellent control of grass-weeds, spurrey (*Spergula arvensis*), redroot (*Amaranthus* spp.), fat-hen (*Chenopodium album*), and pigweed (*Polygonum persicaria*) could be obtained by a pre-emergence application of T.C.A. at 10lb. per acre. I.P.C. also gave good control of weeds, particularly members of the *Polygonaceae*, but rates over 1lb. per acre reduced the germination of swedes.

**WHEAT AND MAIZE**

Hormone weedkillers were applied at two growth stages to wheat. The first application was made at the 3- to 5-true-leaf stage and the second application was made when the wheat was fully tillered. At the early growth stage all preparations, particularly the esters of 2,4-D caused distortions of growth of the cereals. At the later stage of growth no damage occurred from any of the treatments. Observations await confirmation by yield figures, but the results of this trial agree with overseas work, which shows that applications of all preparations of hormone weedkillers made before the 6-leaf stage of growth will cause distortion of seed heads, the more selective M.C.P. preparations causing less damage than equivalent 2,4-D preparations. This is not always associated with reduction in yield.

Trials with maize indicate that the crop may be treated up to 2 to 3 weeks before tassel formation without damage, particularly if water-based preparations of M.C.P. and 2,4-D are used. Hormone damage makes the maize brittle and reduction of yield occurs from this cause if windy weather follows applications.

**LUCERNE**

T.C.A. formed the main treatment in the lucerne trials. In a few trials forms of I.P.C. were also included. All the treatments were applied when the lucerne was dormant. The T.C.A. applications gave good control of annual grasses and rhizomatous grasses, but reduced the yield of lucerne in the first cut after treatment. The I.P.C. treatments did not retard the lucerne growth, but effective grass control was not always obtained. These trials show that grasses can be kept out of newly sown stands of lucerne, but that when old weedy stands of lucerne are renovated by the use of T.C.A. their yield up to the first cut is reduced.

HEADING PHOTOGRAPH: Swede crop treated with T.C.A. at 10lb. per acre (right) and untreated (left).

**DOCKS**

Spectacular control of broad-leaved docks (*Rumex obtusifolius*) was obtained in cowgrass with maleic hydrazide. Docks show too much resistance to be eradicated with hormone preparations in cowgrass, as cowgrass is a susceptible crop and docks are a resistant weed. In this trial no damage was done to the cowgrass by the application of maleic hydrazide at 1lb. and 2lb. per acre.

*—L. J. MATTHEWS*

* * * *

**KIKUYU GRASS**

IN Kikuyu grass eradication trials both sodium chlorate and "Atlacide" have been successful and recent trials with T.C.A. (sodium salt of trichloroacetic acid) indicate that it will also give satisfactory results. In earlier trials it was established that by application of sodium chlorate or "Atlacide" at 5cwt. per acre in summer followed by a spot application to the small patches of kikuyu grass which survived the first treatment a complete kill could be obtained.

In recent trials T.C.A. at 25lb., 50lb., 100lb., and 150lb. per acre was compared with sodium chlorate at 5cwt. per acre. These quantities as sprays and dusts were tested on closely grazed kikuyu grass and also on the upturned sod after the kikuyu grass had been ploughed. Spring and autumn applications were also compared. The efficiency of T.C.A. was considerably increased by application to the ploughed sod, and under these conditions 50lb. per acre applied in autumn gave a kill equal to that from 5cwt. of sodium chlorate, a few plants being left to be spot treated in spring. On closely grazed kikuyu grass up to 100lb. of T.C.A. per acre was required to give similar results. There were no apparent differences between the plots treated with T.C.A. in water and T.C.A. mixed with lime and applied as a dust; sodium chlorate gave slightly better results as a dust and was more efficient when applied to the undisturbed kikuyu grass than when used on the upturned sod.

*—C. M. BLICK*

* * * *

**GIANT BUTTERCUP**

ON wet dairying country giant buttercup (*Ranunculus acer*) becomes a problem in spring and early summer. Though much of the infestation can be prevented by better management designed to eliminate poaching and the associated opening up of the sward in winter, it is often impossible to prevent some growth of buttercup. A trial in the Manawatu put down last spring has indicated that almost complete control of giant buttercup can be obtained by the use of hormone weedkillers. Plots were sprayed when the plants were in full growth but before the main flowering had begun. Odd plants were flowering, but most showed only flower buds. The materials used were all M.C.P. compounds—the amine salt based on the 2,4 isomer, the sodium salt, and the butyl ester. The sodium salt and butyl ester were applied at 2lb. acid equivalent per acre (not based only on the 2,4 isomer content) with 100 gallons of water; the amine salt was also applied at this rate, but as this material is based on a nearly pure 2,4 isomer content, the rate per acre applied of this isomer was much higher than that of the sodium salt and butyl ester.

The material was applied with a knapsack sprayer. It would seem probable that with spray equipment giving a higher pressure the quantity of water used to obtain a good cover could be decreased considerably. One month after spraying all the treatments had given good results, ranging from 80 per cent. to 95 per cent. kill of buttercup. Damage to clovers in the sward varied with the treatments. The weather at the time of the trial was wetter than normal, with ground conditions good for buttercup growth and with slow growth from grass and clovers.

Two months after the spraying almost complete control had been obtained with the amine salt based only on 2,4 isomer and the butyl ester had given a slightly poorer control. Both proprietary lines of the sodium salts used had given 90 per cent. control of the weed. It was very evident during the trial that dairy stock showed a marked preference for grazing the sprayed plots where the buttercup had been killed. At the same time control strips between the plots were not touched and the weed continued to flourish. A further aspect is the increase in the clover content in the sward on the sprayed plots due to the better grazing, despite the earlier temporary damage to clover, particularly from the ester form of M.C.P.

*—B. A. J. SMITH*

# Care of Livestock during October

Contributed by the Animal Research Division

**CATTLE TICK CONTROL**

WHERE cattle ticks are plentiful spraying or dipping should be carried out in November and December to prevent tick worry and kill the adult female ticks before they lay their eggs.

**MATING OF DAIRY COWS**

Before each cow is mated two heat periods or an interval of at least 30 days should be allowed after calving. Cows mated before this period are less likely to get in calf, and the chances of contaminating the bull are increased. Hand mating should be practised and accurate records kept showing the bull used and the dates of all services. Should breeding trouble occur, these records will be of considerable assistance in arriving at a correct diagnosis.

**COCCIDIOSIS IN CALVES**

Scouring in calves under 6 months of age is seldom due to worms. It is much more likely to be due to coccidiosis, especially if blood is present in the droppings. Effective drugs are available for treatment, but these can be obtained only on the prescription of a veterinary surgeon, who should be consulted.

**BLACK DISEASE VACCINATION**

In the east coast areas of the North Island where black disease of sheep occurs vaccination should be carried out during November or early December. This will protect the sheep against the disease, which occurs mainly in summer and autumn. Vaccine should be ordered immediately.

**BLOOD POISONING AFTER SHEARING**

Deaths in sheep after shearing may be caused by infection of cuts or bruises with the blackleg germ. This disease can be prevented by vaccinating at least 3 weeks before shearing. Sheep which have been vaccinated previously may not require re-vaccination, and a Veterinarian or Livestock Instructor should be consulted about the best procedure.

**BLOWFLY STRIKE IN EWES**

In districts where crutch strike causes trouble in ewes crutching or early shearing is advised. Close supervision is necessary to detect cases so that suitable treatment can be applied before the strike becomes too extensive. When treating cases of fly strike shear the wool away to leave a 1in. margin of clean skin around the affected area. Remove the maggots by tapping the area with the shears and apply some reliable non-irritant dressing. Irritant fluids such as kerosene tend to cause restrike.

**BLACK-HEAD IN POULTRY**

Young turkeys and poultry are affected by black-head disease and it can best be prevented by rearing these on land which has not been contaminated by adult poultry. If an outbreak occurs, kill all affected birds and move the remainder to clean ground. In the event of a bad outbreak the local Poultry Instructor of the Department of Agriculture should be consulted, as in some cases treatment may prove beneficial.

**GREENLEG IN BROODER CHICKENS**

Greenleg in brooder chickens occurs in poorly ventilated brooders, especially if they are over-crowded and damp. At the first sign of trouble the necessary measures should be taken to ensure that ventilation is adequate and the litter is changed if it is at all damp.

**ROUNDWORMS IN POULTRY**

Infestation by roundworms is one of the most important causes of poor development of young birds. Growing stock should be treated twice with carbon tetrachloride, once at 3 months and again at 5 months.

**SUPPLEMENTARY FEED**

Supplementary feed is essential to ensure the proper feeding of cows in winter and in dry summers and to control facial eczema in autumn. As soon as more pasture is available than is necessary to meet the immediate needs of stock, the balance should be shut up for silage or hay. On a well-managed dairy farm it should be possible to shut up at least 40 per cent. of the pasture. Crop growing for fattening of weaned lambs is standard practice in South Island districts, and it could with advantage be adopted more widely in North Island districts which experience a dry summer. Crops such as thousand-headed kale and turnips in addition to providing excellent fattening feed for lambs are a splendid insurance against facial eczema. In Poverty Bay and Hawkes Bay they should be sown before the end of October so that they can be well established before dry weather sets in.

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## Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during July and for the season ended 31 July 1954, with comparative figures for the same month and the 1952-53 season, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

**BUTTER**

| Period | Creamery | Tons Whey | Total | Percentage Inc. or dec. |
|---|---|---|---|---|
| July 1954 .. .. .. | 1,657 | 9 | 1,666 | — |
| July 1953 .. .. .. | 2,234 | 12 | 2,246 | — |
| Increase or decrease .. | —577 | —3 | —580 | —25.823 |
| 12 months ended 31/7/54 | 143,440 | 3,024 | 146,464 | — |
| 12 months ended 31/7/53 | 162,259 | 3,159 | 165,418 | — |
| Increase or decrease .. | —18,819 | —135 | —18,954 | —11.458 |

Butter in store at 31 July 1954 was 5700 tons

**CHEESE**

| Period | White | Tons Coloured | Total | Percentage Inc. or dec. |
|---|---|---|---|---|
| July 1954 .. .. .. | 152 | — | 152 | — |
| July 1953 .. .. .. | 194 | — | 194 | — |
| Increase or decrease .. | —42 | — | —42 | —21.649 |
| 12 months ended 31/7/54 | 99,175 | 226 | 99,401 | — |
| 12 months ended 31/7/53 | 103,477 | 140 | 103,617 | — |
| Increase or decrease .. | —4,302 | +86 | —4,216 | —4.069 |

Cheese in store at 31 July 1954 was 7000 tons

If these figures are converted into butterfat equivalent, there is a decrease of 9.832 per cent. in butterfat graded for the 12 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

# Spring Crops and Hay and Silage Harvesting Machinery

## Seasonal Notes by the Extension Division

PREPARATIONS for forage crops to be sown in spring and early summer should now be well in hand, and work should aim at securing a fine, moist, and firm seed-bed by the appropriate sowing time. Hay and silage harvesting machinery should be given a final check over and a supply of necessary spare parts secured.

**MIXED SWEDE AND CHOU MOELLIER CROP**

IT is generally recognised that greater feeding value for maintaining condition in stock can be obtained from crops of swedes than from chou moellier. Moreover the latter crop demands a somewhat higher plane of fertility than swedes do, swedes being better suited to rolling country and chou moellier to heavy flat land, where also utilisation of swedes in wet weather is difficult. Swedes, however, are more susceptible to diseases, particularly to club root, than the hardier chou moellier. Farmers who have had losses of swede crops through disease but who are still desirous of having a swede crop have in the last few years safeguarded themselves by growing a mixed crop of swedes and chou moellier. If the swedes fail, they will still have substantial feeding from the chou moellier. This growing of mixed crops is most evident in the King Country, where on many farms the loss of a winter crop would have serious consequences. There the mixture is growing in popularity despite its evident drawbacks. The tall chou moellier if sown too thick is liable to overshade the swedes, which have a tendency to grow too much neck. Sowings of 3oz. to 4oz. of chou moellier with 8oz. of swedes when drilled give a reasonable balance. On virgin soil and on farms where swedes are not often grown there is usually little risk in growing swedes and this crop, if preferred, can be grown on its own.

*—J. E. BELL*

* * *

**MAIZE FOR GRAIN**

THOUGH river flats are the most suitable areas for growing maize for grain, good yields can be obtained from lighter soils provided they are not run-out fields or naturally poor areas. The area selected for growing a crop should be of high fertility and well drained, and consideration should be given to land lying well to the sun and protected from heavy winds. It is essential, too, that the area chosen should be relatively free from frosts from October to May. Since seed-beds for maize must be fine, deep, and firm, early ploughing and thorough cultivation are necessary to ensure high yields. Ploughing should be as deep as possible without turning up the subsoil. Rolling, discing, and harrowing are all necessary operations that, if possible, should be completed 2 to 3 weeks before sowing. Highest yields of grain follow well-planned cultivation thoroughly done over a long period. Time of sowing is governed by the weather and soil conditions. The soil should be warm and slightly moist, and if conditions are unsuitable or there is danger of frost, it is better to sow maize late than early. In most maize-growing districts sowing may take place from mid-October onward, and even December-sown crops can produce a satisfactory yield. The rate of seeding can vary from 12lb. to 16lb. per acre, depending on size of seed and variety. Of the maize varieties available Pfister Hybrid 360 is the one most commonly grown.

*—S. R. HEWITT*

* * *

**MOWERS**

A MOWER requires frequent attention and the cutter bar should be overhauled before harvest work begins. The knife should be removed and checked for straightness. Broken or worn sections should be replaced and others sharpened. Ledger plates should be checked for alignment by stretching a string above the plates and bending or packing fingers up or down to bring them into line. Cutter bar hinge pins should be checked for wear and may need building up to prevent the cutter bar from hanging back when the mower is working. Finally the whole machine should be checked for damage, strains, and loose bolts.

**BUCKRAKE**

Before silage is ready to cut those who intend to use buckrakes should inspect the implements to ensure that all the tines are in good order. The tines should all be exactly in line, as any tine that is high or low will cause trouble, either by digging into the ground if it is too low or by causing the silage material to roll if it is too high. Points of the tines should be checked for damage and wear, and any faults should be corrected. It is advisable to keep the tines clean and free from rust or paint so that, if necessary, they will handle wilted silage material in the coming season. Wilting material is much more difficult to pick up, particularly if tines are rusty or covered with paint. If the tines are clean, a generous coating of grease now will prevent any rusting. On many buckrakes parts of the hitch are subject to wear and these should be inspected and built up where necessary. Stretched or broken springs on the hitch should be replaced. If a buckrake has been severely strained by overloading, straightening, probably by a blacksmith, will be necessary, but other less serious damage can usually be attended to by the farmer. The most important thing is to attend to this maintenance work in plenty of time. If it is left to the last minute, the farmer will be held up while silage is getting over-mature.

*—D. F. SCOTT*

* * *

**SOWING DEPLETED TUSSOCK LAND**

DEPLETED grazing land is found in the low-rainfall areas (below 20in. per annum) of Central Otago and in the south-east part of the Mackenzie Country, generally below 3000ft. Dominant species are scab weed and sorrel and the hairgrasses are also present. The recent reduction in numbers of rabbits on this country has resulted in a definite improvement in the amount of cover, particularly of the native grasses, but such improvement is gradual and can be accelerated by oversowing. The seed must be of species suited to the environment, and for it to establish the seed should be placed in, not merely on, the ground. On rolling country or valley floors encouraging results have been obtained with a "Sunprong" harrow and promising species sown are tall oat grass, cocksfoot, *Danthonia pilosa*, smooth brome, yarrow, and sheep's burnet. Seed production of some of these is being investigated and it is hoped that commercial quantities will soon be available. Unless there is a good depth of soil or the annual rainfall is 18in. or more, results from sowing of species such as the ryegrasses or the improved types of clovers have not been encouraging. On the steep country broadcasting of seed of suitable species has given slight improvement on sunny faces and a considerable increase in cover where the depth of soil is greater. Initial establishment is often slow, and two or more seasons' spelling assists by allowing reseeding. On shady faces cocksfoot and tall oat grass do well and white and red clovers may also be introduced. However, where there is good tussock cover, it is proving very difficult to establish any species by oversowing.

*—J. M. HERCUS*

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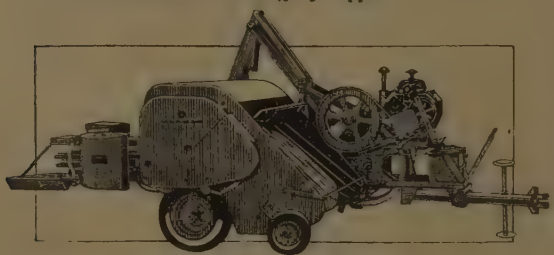

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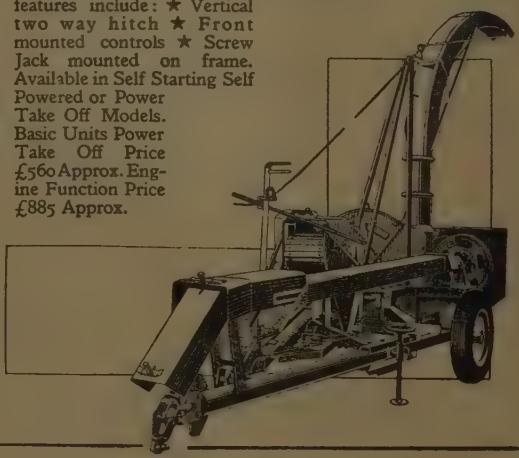

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# Spring Work is Important in Securing Good Yields from Hives

## Seasonal Notes for the Domestic Beekeeper

**WITH the passing of winter and the advent of warmer weather and longer days greatly increased activity takes place in the normal bee colony. Brood rearing increases rapidly and heavy demands are made on the bees' store of honey and pollen. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, discusses some of the precautions the beekeeper should observe at this time.**

THOUGH it is recognised that good management of bees begins in autumn with the provision of ample stores of honey (40 to 50lb. to the hive) and pollen, coupled with dry, draught-free, and damp-free housing, much remains to be done when spring arrives if the beekeeper is to secure the greatest possible yield of honey.

All hives should be checked over for food supply as early in spring as possible. The times when this can be done differ from district to district, varying from early August or earlier in the far north to mid-September in the colder areas. At this first check it is often unnecessary to dismantle the hive completely.

If the colony is in two or more full-depth supers, a good idea of its internal condition can be obtained by separating the top body and tipping it back without removing the cover. A close look at the combs thus exposed will show the presence or absence of brood, the amount of food remaining, and the strength of the hive generally. If the colony has a strong cluster of bees covering 8 to 10 frames and has a normal amount of good, even, healthy brood occupying 4 or 5 frames, it will need little further attention at the moment unless it is short of honey. Should there be less than 15lb. of honey available, the colony will have to be fed either with combs of honey stored from the previous season or by being given a supply of sugar syrup. If syrup is to be fed, it should be given as a heavy solution of not less than 1lb. of white cane sugar to every pound of water. It should be fed to the bees in the evening and not more given at one time than the bees can store in the night. The syrup should be fed while still lukewarm. Suitable feeders of the division board type can be bought from most suppliers of beekeeping material or a simple feeder can be made from a 5lb. honey tin.

**Feeding syrup to bees by using a 5lb. honey tin placed over a hole cut in the hive mat.**

**The centre patch in this frame is stunted drone brood raised in a worker comb and is the work of a drone-laying queen.**

It is well to check the amount of stored pollen also, as adequate supplies of pollen are essential for successful brood rearing. Where early spring sources of pollen are not available or the weather is not suitable for bee flight, or when little or no pollen is present, the colony should be fed a pollen substitute. Information on the preparation and introduction of pollen substitutes and methods of feeding syrup can be obtained from most comprehensive publications on beekeeping or from the local Apiary Instructor of the Department of Agriculture.

### Queenless Colonies

If no brood be present, the colony is most likely queenless. At this time of the year any hive found queenless will probably have been so for some time and this will be confirmed by the aged appearance of the remaining bees. A colony that has been queenless for more than a short period at this time of the year will not usually accept a new queen and any such colonies should be united to a normal colony at the first opportunity.

Examination of the brood combs may sometimes reveal a preponderance of drone brood. This is easily recognised by the raised, dome-shaped cappings. Should this condition be found on worker cell comb, it is an indication that the queen is failing badly and must be replaced at the first opportunity. If no spare queen has been carried over in a nucleus hive, a laying queen must be procured from a breeder, the failing queen removed, and the new one introduced as soon as possible. Another indication that the queen is failing is when the worker brood is uneven with many empty cells interspersed between the larvae. Unless the brood pattern is relatively uniform, it can be safely assumed that the queen is failing or faulty and is due for replacement.

Colonies with failing or faulty queens are not likely to produce profitable crops and are mostly only a liability to the beekeeper. Because of natural difficulties the domestic beekeeper can seldom raise quality queens at this time of year. The whole success of the colony depends on the virility, health, and strain of the queen, and as the raising of such queens calls for specialised knowledge and facilities, the purchase of good queens from a recognised breeder is generally advisable. The money spent on quality queens is recovered many times over in increased honey crops and ease of handling.

### Foul-brood

Any hives in which the bees are found to have died out during winter should be removed and the combs carefully checked over. If dead brood is found, it should be thoroughly examined for the presence of American foul-brood disease (*Bacillus larvae*).

Beekeepers with no previous experience of foul-brood disease may have difficulty in recognising the symptoms, but the following explanation will assist those in doubt. Any brood combs where the cappings on the brood instead of being raised and convex are sunken and discoloured, possibly with pinholes and ragged

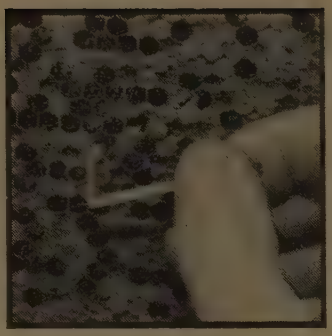
### Notification of American Foul-brood

**UNDER the provisions of the Apiaries Act all beekeepers are required to give written notification of any outbreak of American foul-brood disease in their apiaries to the local Apiary Instructor of the Department of Agriculture within 7 days of the appearance of the disease.**

perforations, should be suspect. If the brood has not been dead for long, it should be possible to make the following test: Insert a wooden match or thin splinter of wood into any suspected cells. If the material in the cell is of coffee colour with a glue-like consistency and adheres to the match so that on withdrawal a thread ½in. or more long can be formed, it can be considered that the disease is present. If the colony has been dead for some time, the diseased larvae will most likely have dried out into the scale stage. When this has occurred it is sometimes difficult for the inexperienced beekeeper to recognise the disease, and where any doubt exists immediate advice should be sought from the local Apiary Instructor.

Hive material and combs from hives where bees have died from undetermined causes should never be brought into further use with bees until the beekeeper is satisfied that they are free of disease. The spores of American foul-brood are extremely difficult to destroy and will remain viable for many years. The greatest care must be exercised at all times, as there is always risk of this disease being present. Implements such as hive tools or material used with or on an infected hive must be well sterilised by boiling for at least 20 minutes or by being thoroughly scorched with fire before being used again. The beekeeper should also thoroughly scrub his hands before moving to another colony.

In spring it is advisable to inspect the brood of all colonies for brood disease at the first favourable opportunity. The spores of the disease are at first present in the honey within the hive and the effects on the larvae usually become evident with the expansion of brood rearing at this time. If there is evidence pointing to the presence of disease, every precaution should be taken to ensure that bees from other hives cannot find access to the diseased colony. The infected colony should be gassed and destroyed by burning as soon as possible.



A frame of brood infected with American foul-brood disease. The decaying matter clings to the probe and ropes out in a glistening brown thread when the probe is withdrawn.

### Long Exposure Harmful

Work in the apiary in early spring should be carried out quickly and with care. Hives should not be left open nor honey exposed other than for the minimum time required to make the necessary examination. Unduly long exposure may cause chilling of brood and an onset of robbing. If robbing becomes apparent, the hives should be closed immediately.

Opportunity should be taken as soon as possible in spring to clean bottom boards, remove grass and any other obstructions from entrances, level up hives, and replace or repair leaky roofs and other faulty equipment.

Standard size hive material in good order is essential for efficient and pleasant working of any apiary.

## Cocksfoot-lucerne Pastures for Light Land

AREAS of lucerne and lucerne-grass mixtures are widely used in North Canterbury as special purpose pastures. These are particularly valuable as a green bite before paddocks sown in standard mixtures begin spring growth, and after an early hay cut they provide ideal fodder for weaned lambs. In addition to giving a better balanced diet for stock, the inclusion of a high-producing grass species tends to suppress the invasion of weeds and weed grasses and thereby increases yields, particularly during early spring and autumn.

On light to medium soils the lucerne-cocksfoot mixture has become most popular. A seeding of 10lb. of lucerne and 3lb. of cocksfoot per acre has usually given satisfactory results. The seed is mixed with equal quantities of lime and superphosphate and sown through every coulter of the grain drill. The chief disadvantage of this method of pasture establishment is that after a few years the cocksfoot tends to smother the lucerne unless careful management is practised.

Trials conducted by the Department of Agriculture show that where the species are sown in alternate drills at the rate of 6lb. of lucerne and 3lb. of cocksfoot per acre practically no competition occurs, and farmers using the mixture are advised to adopt this method of sowing. Whatever the method of sowing, careful grazing management is essential if a well-balanced pasture is to be maintained. During early spring break feeding is strongly recommended. At this season ewes show a marked preference for the grass and should not be left on a break once lucerne plants are being close grazed.

During October, when normally other pastures are supplying sufficient feed to support the flock, the lucerne-cocksfoot stand may be closed for hay. It will usually be found that the earlier grazing will have suppressed the grass sufficiently to give a lucerne-dominant hay cut. The hay crop should be off the paddock sufficiently early to permit regrowth to reach a stage suitable for lambs at weaning. Lambs invariably graze the lucerne and tend to neglect the cocksfoot, but after a further spell the paddock will provide useful flushing for ewes, which are not so selective in their feeding.

*—E. G. SMITH,*
*Fields Instructor,*
*Department of Agriculture,*
*Rangiora*

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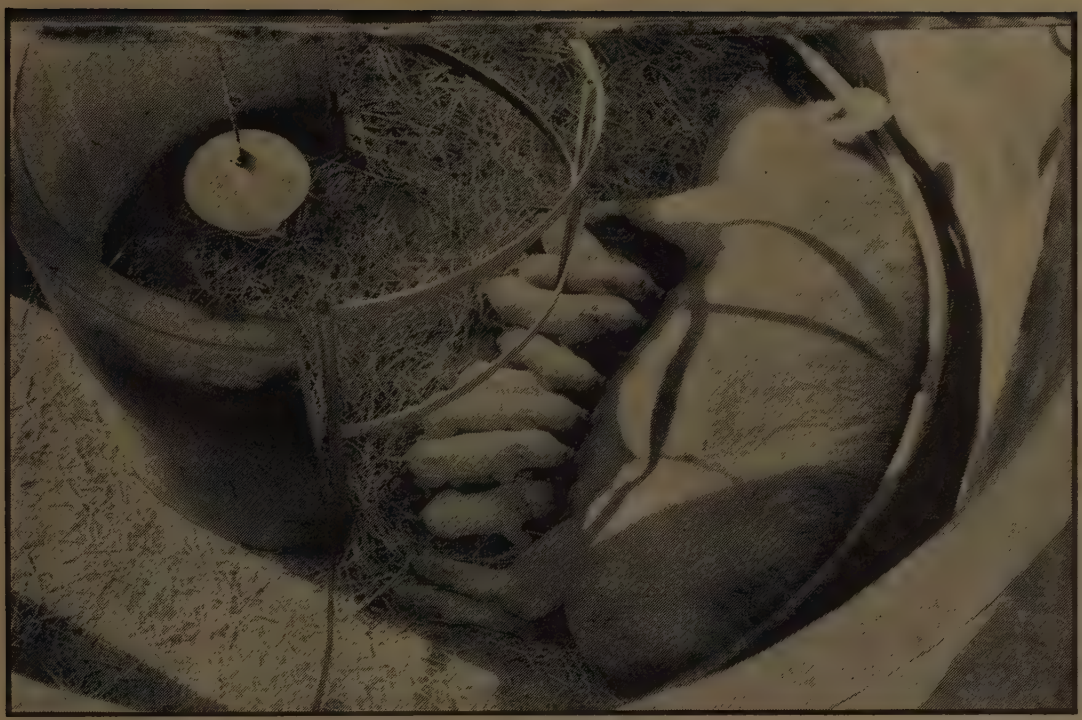

# The Ruakura Round Farrowing House

By D. M. SMITH, Research Officer, Department of Agriculture Animal Research Station, Ruakura

LOSSES among newly born pigs are a world-wide problem. Farm surveys in New Zealand have shown that the mortality rate in this country is similar to that in overseas countries and that approximately 25 per cent. of all pigs born die before weaning. Of these almost half are overlain by the sow during the first week after farrowing, the majority being crushed in the first 3 days. The importance of these losses to the industry is generally appreciated. There are fewer pigs left in the litter to share the cost of feeding the sow during her dry period and during lactation and there are fewer pigs to drink the skimmed milk available during the dairy season. A loss of 10 per cent. of pigs born may easily represent a reduction of much more than 10 per cent. in the net returns from pig keeping. The principal aim in the designing of the farrowing house described in this article was to reduce losses of young pigs.

SEVERAL methods have been suggested for reducing losses caused by overlying. The farrowing rail, the farrowing crate, the sloping floor, and the brooder lamp are some of the more recent aids. On the other hand, there are some who believe that no fixtures should be added to the farrowing pen because sows should possess sufficient mothering ability to avoid killing or injuring any of their offspring. This belief may or may not apply when sows are allowed to farrow in what would be natural surroundings. It is, however, a little too much to suggest that an 8ft. x 8ft. wooden farrowing house represents natural surroundings for a pig.

The efficiency of the various methods mentioned, other than the farrowing crate, have been examined at Ruakura, with the following results.

## Farrowing Rail

The distance which a farrowing rail should be from the wall and its height above the floor have been the subject of various arguments, and recommendations also have varied. The object of installing rails is simply to stop the sow from crushing a piglet against a wall while lowering her bulk to the floor. On this basis it appears immaterial whether the rails are 6in. or 9in. from the wall and similarly whether 6in. or 9in. above the floor. During farrowing piglets will often try to perch on the sow's shoulder or back, a position which leaves them extremely vulnerable to being shaken off between the sow and the wall. The rails eliminate losses from this or other similar causes.

On Ruakura experience, however, the main weakness of the farrowing rail is that in houses with or without farrowing rails 90 per cent. of losses caused by overlying occur away from the walls. There is nothing surprising in this, since piglets generally prefer for the sake of warmth to lie against the sow's belly after suckling. When the sow rolls on to her belly before getting to her feet she can very easily crush or suffocate the piglet or piglets lying closest to her.

## Sloping Floor

The sloping floor was designed to eliminate losses caused by overlying. Its usefulness was based on a flat statement, allegedly of fact, that a sow always lies with her back up a slope. The piglets, therefore, on being born roll down the slope to a safe area at the bottom and after suckling naturally gravitate back to this area. Theoretically the sloping floor should reduce losses.

These floors have been tried at Ruakura, 7 sows being farrowed on them; 6 sows invariably lay with their backs down the slope and the other invariably lay with her head down the slope. Losses were not reduced.

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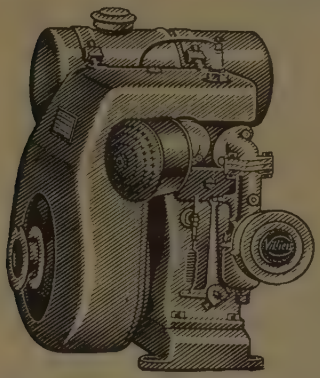

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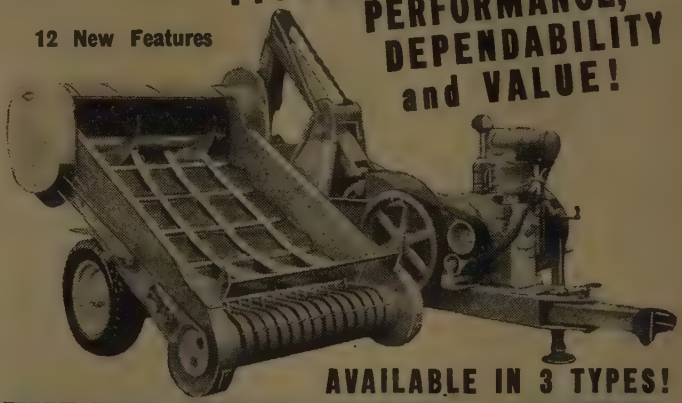

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## Brooder Lamp

The introduction of the brooder or heat lamp has been heralded as a great advance and a large part of the answer to losses through overlying. The lamp, partly because it lights a section of the pen and partly because of the localised warm area it provides, is expected to entice the young away from the mother to a guarded and safe place. An obvious additional advantage arising from the provision of heat is the better growth and vitality of the piglets.

Lamps have been used extensively at Ruakura in 8ft. x 8ft. houses and losses from overlying reduced from 8 to 6 per cent. of the pigs born. It was found, however, that on many occasions when the sow lay with her udders away from the corner holding the lamp the piglets piled up against her belly and did not bother to make the journey round the sow to the safety zone provided.

## Farrowing Crate

The farrowing crate, which is simply a strong crate in which the sow is confined at farrowing and for up to a week after farrowing, is designed to prevent the sow from turning round and ensures that she lies down in only one position within the building that houses her. Heat lamps are used in addition to the crate so that the litter is in one area and the sow invariably in another.

There are several disadvantages to this method of farrowing: First, the sow must be accustomed to her quarters by being held in the crate for a short time each day for about a week before farrowing. Secondly, a reasonably large, draught-free building must be available to house the crate and its equipment. Thirdly, for best results the sow should be attended at farrowing so that the piglets can be introduced to their quarters under the lamp. This last disadvantage has been overcome in modern American piggeries, where batteries of 4, 8, or 10 crates are permanently set up for farrowing.

The main disadvantage of a farrowing crate is the labour required to service the sow, which must be fed and cleaned in a restricted area. Because of this, the method is not likely to appeal to the New Zealand farmer.

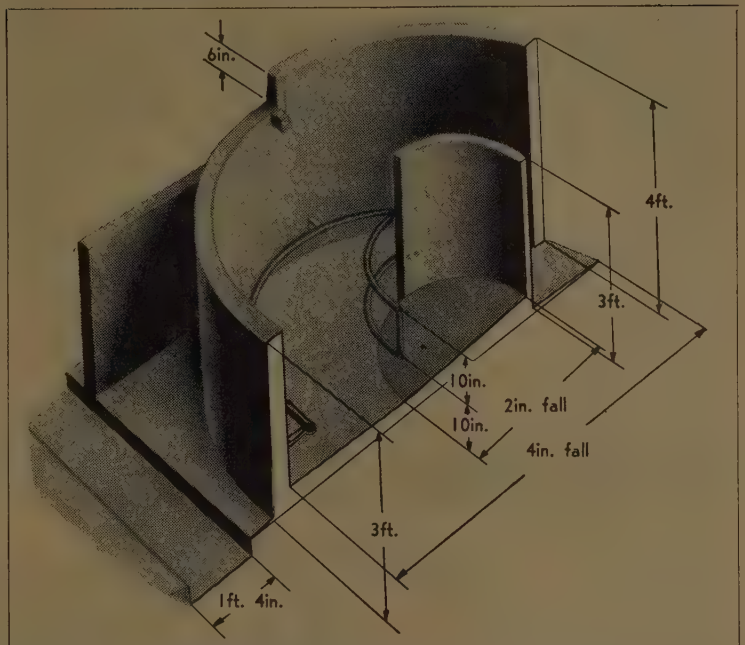


Fig. 2—Section through Ruakura round farrowing house. The front entrance is at right. The over-all fall in the floor to the front is 4in. with reverse fall on the protected zone of 2in.

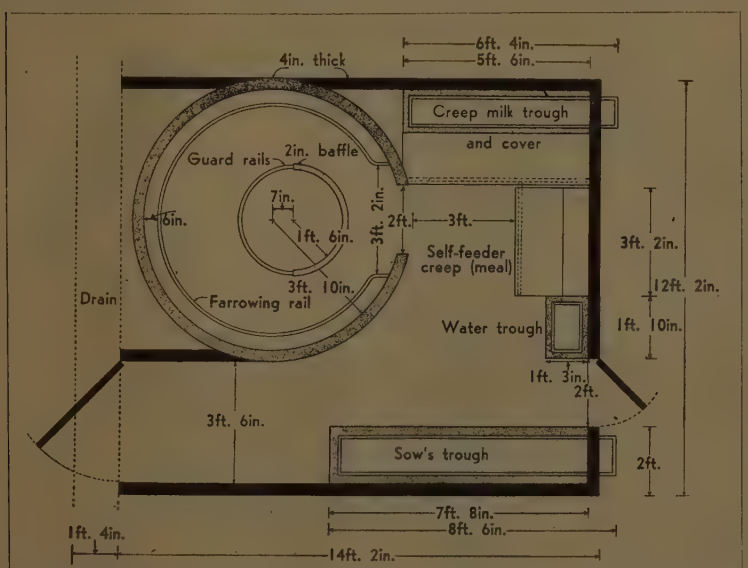


Fig. 1—Ground plan of Ruakura round farrowing house, showing layout of house and yard. Milk troughs extend through the wall to the feeding race for convenience in feeding.

## Other Precautions

Many New Zealand farmers attend their sows during farrowing, clean the pigs at birth, see that they have ample opportunity to suckle, and then place them out of harm's way in a basket or under a heat lamp. This system, too, has been followed at Ruakura during the collection of data on farrowing behaviour of sows, pigs born dead, and method of presentation of piglets at birth. Despite the precautions taken during the period of attendance, it was not uncommon to leave the sow at 3 a.m. suckling 10 piglets and to return at 7 a.m. only to find three overlain. Losses continue at a comparatively high rate over the first 3 days after farrowing, so that attending the sow during the period of delivery still leaves 2 to 3 days during which the piglets are no less vulnerable to injury or death.

This, then, is the general background which led to a realisation at Ruakura that some method would need to be devised to cope with the dangers inherent in the habits of sows and litters during farrowing and for at least 3 days after.

## Overseas Research

However, several significant findings have come from recent surveys in England and research work in America.

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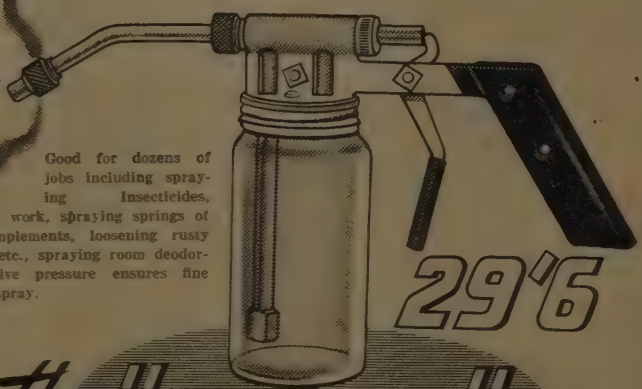

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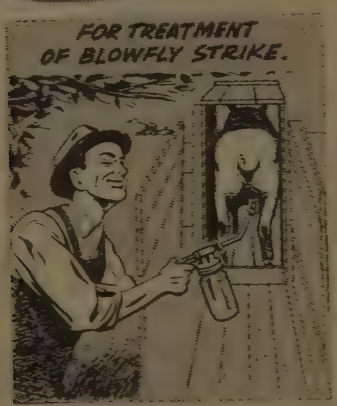


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The first is that whereas adult animals and most young animals have a mechanism which enables them to adjust various body functions to conserve heat, the baby pig does not possess this ability until about a week old. In the baby pig the thermo-regulatory mechanism, as it is called, is not effective at birth. For this reason the piglet is especially susceptible to cold. Research findings have shown that a newly born piglet subjected to a temperature of 32 degrees F. will show a drop in body temperature of 9 to 12 degrees. Piglets kept under these conditions become chilled, use a large part of their feed in shivering in an attempt to get warm, try to nestle in and under the sow, are disinclined to suckle, and in general have a much reduced chance of survival. Temperature recordings in orthodox houses at Ruakura have shown that with a temperature of 26 degrees F. outside a house containing a sow and 10 piglets the temperature inside was 34 degrees F. It is quite common, therefore, for farrowing house temperatures in New Zealand to become dangerously low.

Secondly, research at the University of California has shown that pigs below 100lb. liveweight require a temperature of 75 degrees F. for optimum growth and feed utilisation. This applies with greatest emphasis to the small piglet, but is true over the whole period of suckling.

Thirdly, surveys conducted in England on the efficiency of pig housing have shown that for a sow and litter to be comfortably warm in an unheated house the air space to be warmed by the pigs should not exceed 160 cub. ft.

There are three phases to the problem of efficient housing:—

1. The litter requires a surrounding air temperature of at least 75 degrees F.

2. If the whole house were warmed to this temperature, the sow would be distressed. Her optimum environmental temperature is about 60 degrees F. The heat lamp, therefore, solves the problem adequately, since it supplies a localised area within the house with an environment best suited to the newly born, but does not raise the rest of the house to a temperature which will cause inconvenience to the sow.

3. Heat lamps, however, are relatively expensive to run and therefore the aim is to use them only for the first week of the piglet's life. It is after the lamp has been dispensed with that the cubic capacity of the house becomes really important. From the end of the first week on to weaning the sow and litter should be able to keep their surroundings sufficiently warm to enable the suckers to grow rapidly and efficiently. The English investigations have suggested a maximum of 160 cub. ft. as the capacity of a house designed to meet these requirements.

## Ruakura Farrowing House

Briefly, then, a farrowing house should fulfil the following specifications to satisfy the requirements of the pigs that are to use it:—

1. A farrowing rail is necessary.
2. The sow should, if possible, be made to lie in one area of the house only.
3. The piglets should be encouraged to lie away from the sow.
4. The tendency for piglets to lie near the sow's udders should be recognised.
5. A heat lamp should be used to provide a localised area of heat.
6. This area should be near the sow's udders and also free from draughts.
7. The cubic capacity of the house should not be more than 160 cub. ft.

Fig. 3—Round farrowing house in plaster construction on 6in. square mesh spot-welded reinforcing with expanded metal skeleton for walls and roof. The entrance is high enough for convenient access.

**The round farrowing house developed at Ruakura was designed to satisfy these requirements.**

The round design (7ft. 8in. in diameter) eliminates corners and reduces the area of the floor to about 46 sq. ft. as against 64 sq. ft. in an orthodox 8ft. x 8ft. farrowing house (Fig. 1). The farrowing rail is 6in. from the wall and 6in. from the floor at the back of the house. The piglet safety zone, 3ft. in diameter, is near the centre of the house and is bounded on the side nearest the door by a solid baffle, which stops all draughts from reaching the piglets, and on the inside by two rails, the bottom one 10in. above the floor. This railing allows the piglets to move freely to the sow, but keeps the sow away from the piglets (Fig. 2).

This safety zone is placed off-centre, being 7in. nearer the door than the back of the house. This placing results in a restricted passage 18in.

Fig. 4—The prototype round house. This type of roof is not satisfactory.

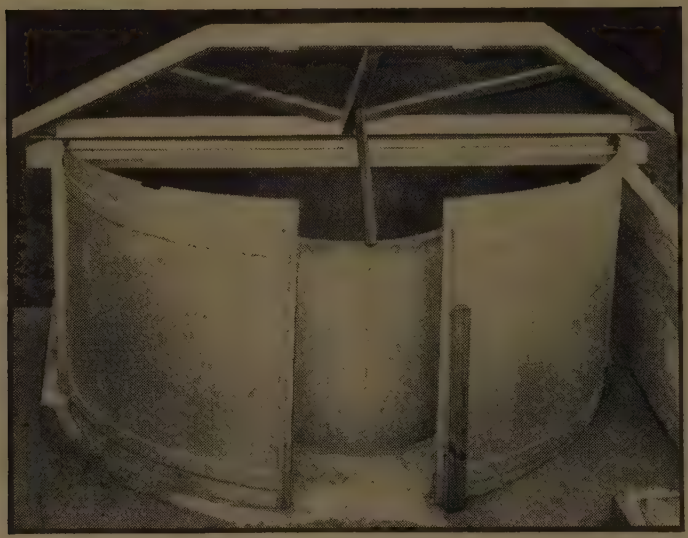

Fig. 5—One of the latest, cheap, experimental designs of round farrowing house. It is built of hardboard bolted to an iron frame. The roof is in two sections at different levels. It is light and provides easy access to the central zone.

wide for the sow from the doorway to the back. At the back of the house a width of 2ft. 6in. is available for the sow to lie down. The curvature of the farrowing rail and the safety zone rails ensure that the sow will almost invariably lie with her udders toward the safety zone occupied by the piglets. In effect the placement of the baffle has provided the essentials of a farrowing crate; namely, the sow lies in one restricted area and cannot turn round in the house. At the same time the main objection to a farrowing crate is avoided in that the sow can enter or leave at will while becoming accustomed to the house and does not have to be manhandled in.

The extent to which these houses have been effective at Ruakura is demonstrated by the fact that losses from overlying have been reduced from 6 per cent. in 8ft. x 8ft. houses with lamps to less than ½ per cent. Though sows have not been attended at farrowing, some precautions have been taken. When the sow is due to farrow she is confined in the house each night by blocking the doorway with a light hurdle. This precaution is taken to prevent the sow from farrowing in the yard, should she make up her mind to do so, and in addition stops newly born piglets from wandering out of the house during their first hours of life.

The design of the round house has been aimed at satisfying the known requirements of the pigs using them. To reduce air space to the required 160 cub. ft., even with a 46 sq. ft. floor area, it has been necessary to lower the roof. The height recommended is 3ft. at the back and 4ft. in front. The cubic content of this house is approximately 164 cub. ft. Through reduction of the height of the house, however, the requirements of the farmer who has to clean the house and may wish to attend the sow have been neglected. To offset this various types of roof have been designed (Figs. 3, 4, and 5). Fig. 3 shows a design developed by Mr. H. E. Clarke, Pig Supervisor for the Auckland District Pig Council, and Figs. 4 and 5 show two types of roofs designed at Ruakura. The roof shown in Fig. 4 was the first attempt at overcoming the problem. It has the disadvantage that when either side is raised any water on the roof falls into the house and it is not recommended.

Ease of cleaning must be considered in the design of any pig house. The absence of corners in a round structure aids in this respect. In addition a fall of 4in. from back to front is recommended, the safety zone being raised so that the fall in this area is opposite to that on the house floor. As a result the safety zone can be kept dry while the rest of the house is washed down.

The materials used in the construction of these houses are still a subject for experimentation. To date concrete has been the main material used, though Fig. 3 shows a house made of reinforcing plastered over. No moulds are needed for this type of construction. Its disadvantage is that a farmer needs some instruction before he can expect to undertake successfully building in these materials.

It is hoped, however, that the final answer to round house construction will be a cheap method of prefabrication.

This article has concentrated entirely on the need to provide a means of meeting the requirements of the sow and her owner during farrowing and up to the weaning stage. It is realised that on most farms pig houses are often expected to act both as farrowing houses and as fattening houses.

Where pork production is the aim and new layouts are being constructed these round houses should prove suitable for fattening. When the rails are removed from the safety zone ample room is available to house 8 top-weight porkers. The experience of a number of farmers in Auckland Province has shown this to be practical.

Where bacon production is the aim or where a portion of the output is to be taken to bacon weights the problem of size of pig in relation to floor space available does not arise. Most New Zealand baconers are over 6 months old at slaughter weights and must be housed in some other form of housing to leave the farrowing houses free for further farrowings. In addition the temperature requirement of porker weight pigs is about 75 degrees F., but that of bacon weight pigs is only 60 degrees F. Thus though the restricted air space of the round house should enable porkers to provide an optimum environmental temperature, this feature may become a disadvantage when heavier pigs are confined in the same air space. The provision of additional fattening accommodation for baconers is therefore necessary.

It is not suggested that present farrowing accommodation should be discarded. On most dairy farms the erection of one round house in addition to current pig housing would probably prove sufficient. Each sow in turn could be farrowed in the round house, spend at least the first three post-farrowing days with her litter there, and then be moved to an orthodox house to make room for the next sow to farrow.

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# Work of Wallaceville Animal Research Station

**THE great expansion of New Zealand's animal industry has increased immensely the work of those engaged in animal research at such centres as the Department of Agriculture's Wallaceville Animal Research Station. The contribution of those doing such work is not fully appreciated, and in this article I. J. Cunningham, Superintendent of the Station, describes briefly the diagnostic and research activities of the Station to show how it attempts to serve the animal industry of New Zealand.**

WALLACEVILLE Animal Research Station is in the Hutt Valley about 20 miles north of Wellington. The Station became part of the Animal Research Division of the Department of Agriculture when the Division was formed in 1939. Before that it was known as the Veterinary Laboratory and had been so named since it was established in June 1905 to accommodate experimental animals and veterinarians to carry out diagnostic and research work on the diseases of farm stock.

Before 1905 there was no farm to carry experimental animals, and diagnostic work had to be done in grossly inadequate quarters in sheds near Government administrative headquarters in Wellington. This was unsatisfactory for the laboratory workers and a source of considerable nuisance to the administrative groups. Premeditated failure to dispose of carcasses of dead animals was the final spur to making money available for the purchase of 100 acres of land at Wallaceville and the erection of a small laboratory of about 2000 sq. ft. This building, illustrated below, served as the headquarters of the Veterinary Division of the Department of Agriculture until 1910, when a new Livestock and Meat Division of the Department was formed with headquarters in Wellington. The Veterinary Laboratory continued as the centre of veterinary diagnostic and research work.

Wallaceville Veterinary Laboratory in 1905.

## Functions of the Station

Wallaceville Animal Research Station has essentially the same purpose at present. Its functions are to identify the diseases affecting animals in New Zealand; to find out as much as possible about those diseases; to learn where they occur, why they occur, and how important they are; to find how to cure them, and, most important of all, how to prevent them.

The facilities to carry out this work are the scientific staff and assistants, buildings for laboratories and associated services and for housing small experimental animals, and land to carry farm stock under experiment.

The scientific staff of about 30 members is recruited from varied fields of training. There are veterinary graduates who have special training in pathology, bacteriology, or parasitology, and science graduates who have special training in bacteriology, biochemistry, or toxicology. With technical assistants and those who care for experimental animals and provide general services there is a total staff of about 120.

Some of the permanent laboratory buildings are illustrated in the heading photograph of this article. Other buildings house laboratories, offices, workshops, and laboratory experimental animals or farm animals under experiment.

HEADING PHOTOGRAPH: The main buildings at Wallaceville Animal Research Station.

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The laboratories are equipped with apparatus necessary for the detailed work required by present-day techniques. A modern microscope is illustrated at right alongside the instrument in use in 1905, and on page 277 is shown some of the laboratories.

Land available is 100 acres surrounding the laboratories and owned by the Department of Agriculture, with 120 acres of flat land and 100 acres of poor hill land on lease. This land carries experimental cattle, sheep, and pigs and provides some of the foodstuffs for the guinea-pigs, rabbits, rats, and mice that are essential tools in the work of the Station.

## Diagnostic Services

The diagnostic service does not deal with the day-to-day problems of accident or disease that arise on individual farms. These are the province of veterinary surgeons in farmers' veterinary clubs, in the Animal Industry Division of the Department, or in private practice, and of Livestock Instructors and Poultry Instructors of the Department. These men sometimes need information that can be got only in a laboratory to help them to decide just what disease they are dealing with. For that help they turn to Wallaceville. A field man may, for example, suspect lead poisoning as a cause of deaths in calves. He cannot carry out an analysis himself, but forwards a liver and asks that the lead content be measured. More than 5 parts of lead in 1,000,000 parts of liver indicates that the calf has eaten enough lead to poison it.

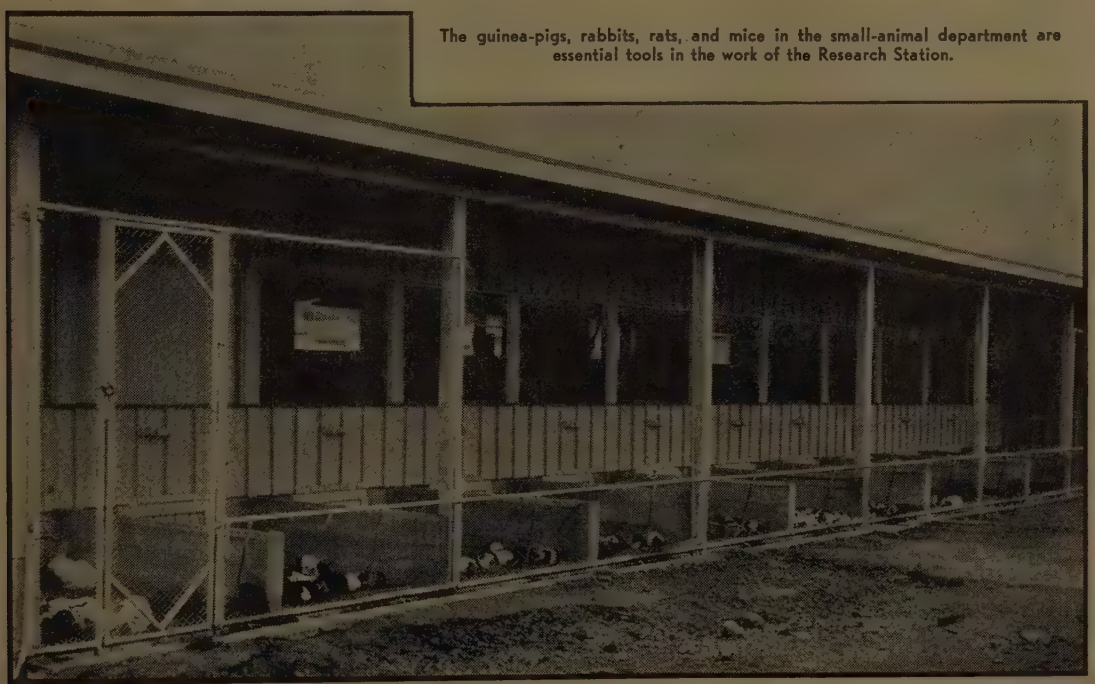
Suspected enterotoxaemia as a cause of death in sheep may need to be confirmed by laboratory tests to ensure that this is the cause of death and that other causes have not operated. Abortion in cattle can be caused by several different infective agents and the one responsible can usually be identified by tests on blood or other fluids. With such identification made, the veterinary surgeon attending the case can work out more precisely the treatment or control. Sometimes, where the symptoms are not specific, a whole range of tests may assist in reaching a diagnosis that might otherwise be overlooked.

A microscope of 1905 (foreground) and a modern one.

This diagnostic service is concerned mainly with cattle, sheep, pigs, poultry, dogs, and bees and is available free of charge to all veterinary surgeons whatever their mode of employment and, of course, to field officers of the Department of Agriculture and to others engaged in advisory work to farmers and apiarists. Direct forwarding of samples by farmers is not invited, because this would be too cumbersome and wasteful. Most problems of disease can be settled at once by veterinary surgeons who attend cases on the farm.

Special knowledge is required to decide if specimens are necessary, which specimens to collect, and how to treat them after collection so that they arrive at Wallaceville in a suitable condition for examination. Field men have the special training needed for selecting specimens and are provided with special containers and

The guinea-pigs, rabbits, rats, and mice in the small-animal department are essential tools in the work of the Research Station.



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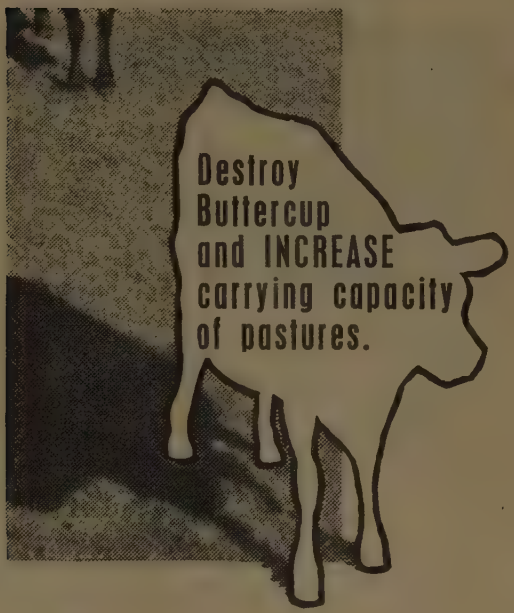


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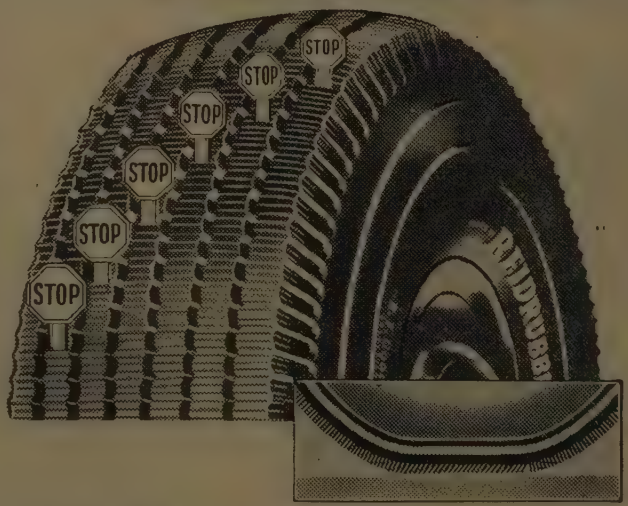


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packaging for forwarding specimens so that they will transport satisfactorily and cause no nuisance in transit. In the course of a year specimens are sent to Wallaceville from some 6000 farms.

Another function of diagnostic work is to maintain a watch on disease incidence to learn whether any particular disease is becoming of increasing importance. An example of this phase is vaccination against blackleg in sheep. Several years ago it was indicated, from diagnostic specimens, that some vaccinated sheep were dying of blackleg. A detailed investigation of the effectiveness of the vaccine was therefore undertaken and a new procedure worked out which has greatly improved the vaccine and prevents such losses.

Diagnostic work will indicate the presence of diseases previously unknown in the country. In the last 5 years about 29 diseases previously unrecorded have been diagnosed and some of these have been of major economic significance and have become important subjects of research into control methods.

Finally, diagnostic work is necessary to determine, in suspected cases, whether a serious exotic disease has entered the country. Such suspected cases are at once quarantined by Animal Industry Division veterinary officers, but in many instances it is necessary to have the diagnosis of the disease confirmed by controlled test before a slaughter policy is carried out. Swine fever is one such case, for there are several disease conditions in pigs that are closely similar to swine fever. Proper diagnostic tests in strict quarantine can show with certainty whether the suspected condition is swine fever.

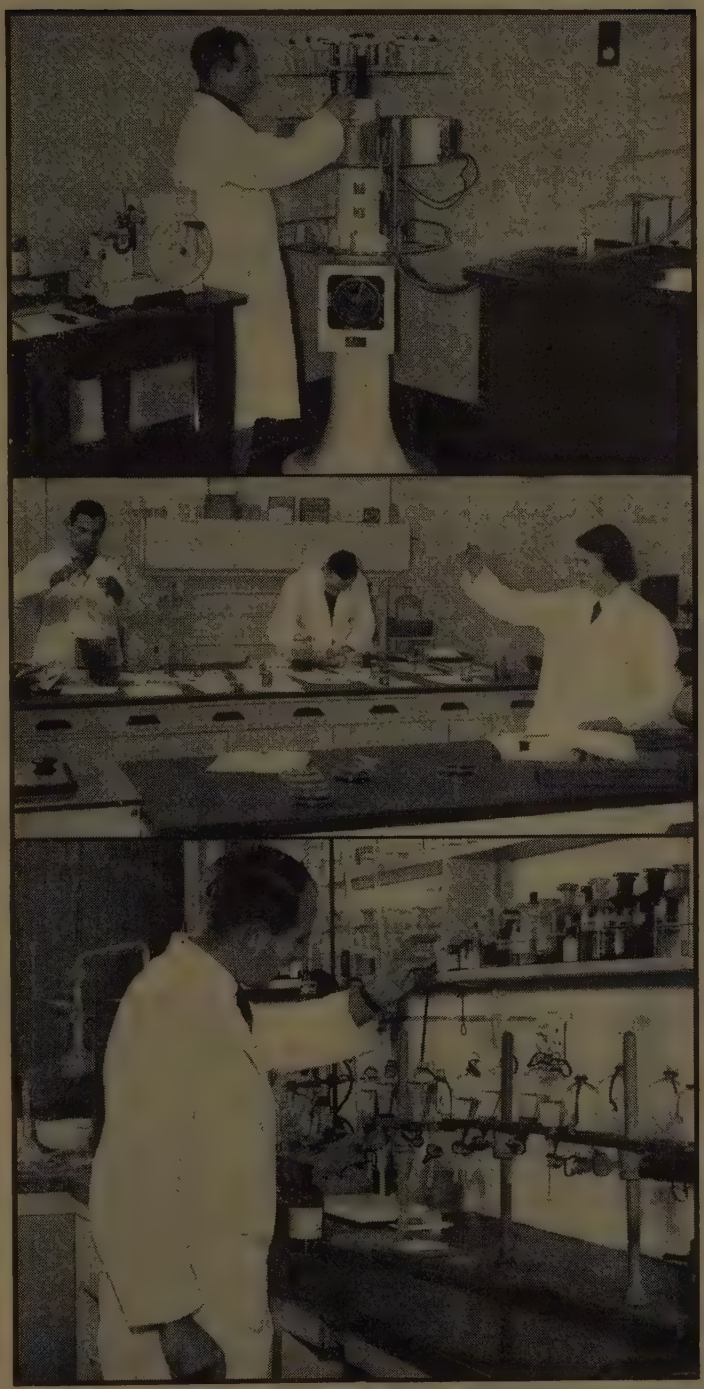
## Research Work

Research work is an essential consequence of diagnosis, because identification of a disease is but the first step in its control. At Wallaceville research groups fall into departments of bacteriology, biochemistry, parasitology, and pathology, as these are the general classes into which diseases fall and the disciplines in which workers are trained. However, for special studies, research groups are formed from one, two, or more of these departments according to the special nature of the problem. It is convenient, for the purpose of illustrating the work that goes on, to use the headings mentioned above.

### Bacteriology

Bacteriological work is concerned with the control of infectious diseases of livestock. Primary consideration is given to the diseases of greatest economic importance and to diseases that are a hazard to public health. Some of the economically important infectious diseases on which work has been carried out are contagious abortion and other forms of abortion and infertility of cattle, infertility in sheep, and blood poisoning and related infections in sheep and calves.

The development of nation-wide calfhood vaccination with Strain 19 against contagious abortion is one of the results of research in bacteriology. This particular strain of germ was developed overseas, but its suitability



Veterinarians and Livestock Instructors sometimes need diagnostic information that only a laboratory can supply, and for such work and the consequent research the Wallaceville laboratories are well equipped.

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in New Zealand had to be examined before it could be widely employed. Experimental observations showed that a satisfactory immunity persists for at least three calvings when animals have been vaccinated as calves. Methods to make and test the vaccine and to use it in the field were then worked out and considerable quantities of the vaccine made and issued free. At present most dairy calves in New Zealand are vaccinated with commercially made vaccines and contagious abortion has ceased to be a major problem. Other causes of abortion in cattle, notably *Vibrio foetus* and leptospiral infections, are now under study in a search for suitable preventive measures.

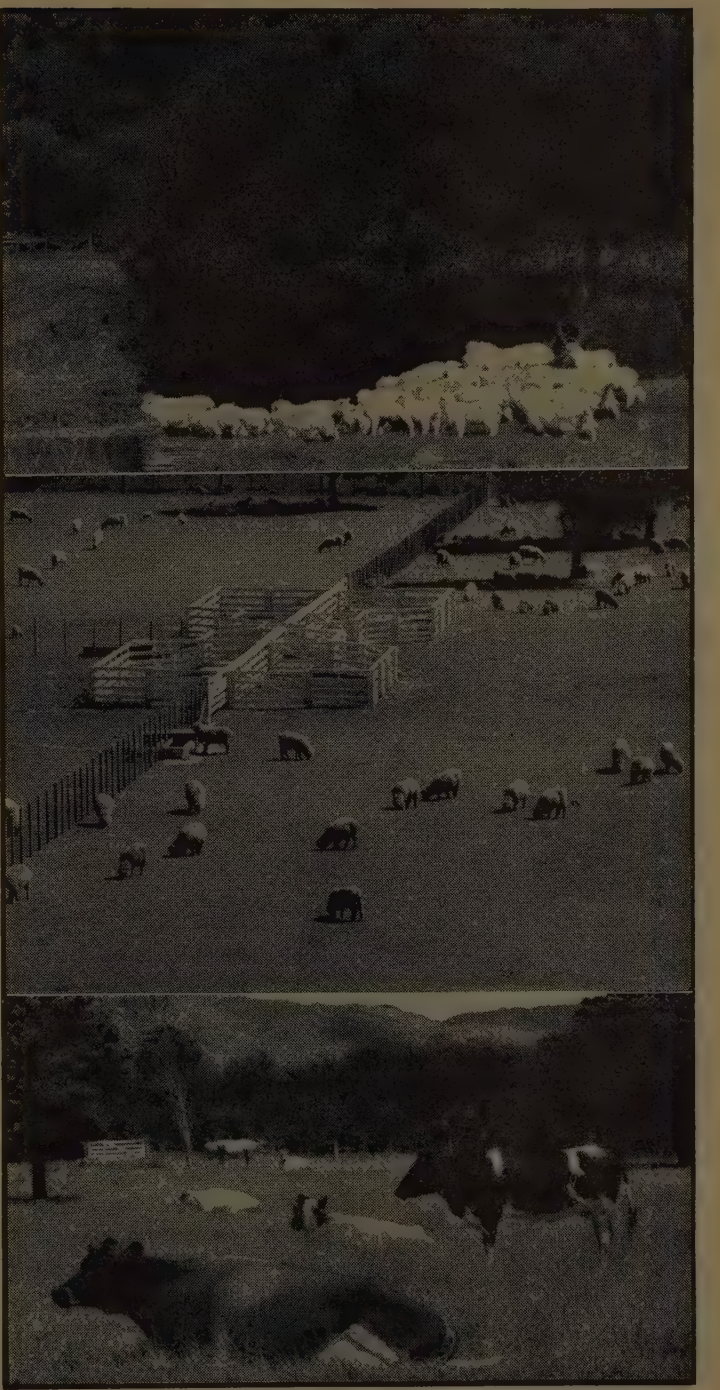
One cause of infertility in sheep has been shown to be a germ related to the one responsible for contagious abortion. This new germ causes epididymitis in rams and abortion or early deaths in some lambs. The identification of the germ in these conditions has been made and methods to protect rams and ewes against its effects are being sought.

Blackleg in sheep and calves is the result of infection by one of the blood-poisoning groups of germs. The means to control this in sheep by using a vaccine was found many years ago, but the vaccine occasionally failed to protect. Research on methods of making the vaccine has improved its protective value by some hundreds of times so that the effectiveness of the vaccine is correspondingly increased.

**Biochemistry**

Biochemical research work is concerned with the alteration in the chemistry of diseased animals or of their food that may help to explain the cause of disease and show the means to control it. For example, diseases due to deficiency of copper in the food or this deficiency aggravated by excess of molybdenum have been discovered and the means to control these found to be by top-dressing pastures with bluestone. Cobalt deficiency disease has been examined, new areas of cobalt deficiency defined, and circumstances under which the disease develops worked out. Control of both these diseases in inaccessible country by aerial top-dressing has also been demonstrated. Rickets in sheep on greenfeeds has also been investigated and the cause shown to be too little vitamin D and too much carotene in the fodder. The cure is to provide extra vitamin D and the most effective means is a single large dose of the vitamin before the winter begins.

Toxicology is another application of chemistry to animal health. The problems in this field are to work out the amounts of the different common poisons that will harm animals, the means to detect whether a poison has been taken, and ways to prevent animals from gaining access to such poisons. Much information has been gathered for usual poisons such as lead and arsenic, but new problems arise from time to time as new chemicals come into industrial use. For example, zinc chromate paints used to protect aluminium and pentachloronaphthalene compounds employed as wood preservatives have recently been found to be harmful to stock. Even a fertiliser such as North African phosphate has been shown to be toxic and to cause a severe drop in



Land attached to the Station carries experimental sheep, cattle, and pigs. Land available is 100 acres surrounding the laboratories; another 120 acres of flat land and 100 acres of poor hill land are leased.

milk production in cattle if they graze pastures too soon after topdressing.

**Parasitology**

The field of parasitology covers both internal and external parasites and especially those which interfere with the thrift of domestic stock. Investigations have been made of the distribution of internal parasites over New Zealand and of suitable drenches and times to use them for control purposes. Similar studies are made of the occurrence and distribution of external parasites and of effective dipping fluids used against them. Also studied is the manner in which sheep become immune to parasites, in an attempt to produce this immunity to protect grazing sheep.

Protective treatment of animals against parasites has itself introduced some problems. One of these is temporary blindness in calves treated with phenothiazine, found to be caused by the action of sunlight on the eye and preventable by keeping calves out of sunlight the day after treatment. Another is lameness of sheep after dipping in modern washes, caused by infection and swelling of abrasions near the hoof, and which can be prevented by addition of an antiseptic to the dip wash.

**Pathology**

Pathology is the study of disease processes in animals and the changes that take place in function and structure. Examples of the results that pathological studies have given are recognition of rickets in sheep grazing on green oats and of infection as a cause of abortion in ewes.

The diseases, and breeding and management of bees and the processing of honey are also studied at Wallaceville. The main lines of work have been the examination of artificial insemination of bees to improve breeding, the tracking of a poison that occasionally occurred in some honeys to the tutu plant, thus eliminating any risk of poison honey being harvested from this source, and the processing of lower grade honeys into meads and other alcoholic beverages.

# Molybdenum Responses on Peas in Nelson

**RECENTLY there has been considerable interest in molybdenum responses in New Zealand and intensive research is being carried out on the application of this minor element. Molybdenum superphosphate is being manufactured in both islands and farmers are becoming aware of the value of judicious applications of molybdenum. This article by P. D. Blomfield describes investigative work on the use of molybdenum on garden peas in Nelson.**

RESPONSES have been obtained with a number of plants which were listed in an article "Molybdenum Responses in North Otago" by W. R. Lobb in the July 1953 issue of the "Journal". Few, if any, responses have been recorded with peas in New Zealand.

In conjunction with S. Kirkpatrick and Co. Ltd., of Nelson, who are interested in the production of peas for canning the writer carried out observational trials on the Waimea Plains and on Moutere gravel land. There have been some responses to molybdenum on the Moutere land, especially with clovers, and several farmers on this type of land are applying molybdenum superphosphate; on the Waimea Plains some responses have been obtained with brassicas.

On the Waimea Plains on stony silt loam at Appleby no visible response was obtained with peas. However, on a nearby paddock peas of the Hursthouse variety sown with 3cwt. of molybdenum superphosphate per acre were an exceptionally dark green instead of the normal yellowish green. Nevertheless it was impossible to say that this was attributable only to molybdenum.

On the Moutere land on the Motupiko silt loam a very definite response was obtained. The Motupiko silt loam is an acid soil and low in phosphate; potash also tends to be low. These Motupiko loams form part of a complex known as the Moutere soils, which are problem soils in Nelson. They are deficient in many major and minor nutrients, and if a response were obtained anywhere, it should have been obtained there.

## Methods of Application

In the trials sodium molybdate at 2oz. per acre was applied to different areas in different ways: Sprayed before emergence, sprayed after emergence when the peas were 2in. high, dusted on the pea seed, and applied as molybdenum superphosphate. On the Motupiko silt loam only the two spraying methods were used. There one area of Greenfeast peas was sprayed at sowing time and another area when the peas were 2in. high. Both areas of treated peas stood out in a striking fashion from the untreated ones. The untreated peas were of a poor colour and looked generally unthrifty. Leaves were pale green to yellow. The treated peas were dark green. Many farmers thought a nitrogenous fertiliser had been applied. Treated peas were definitely healthier and were slightly larger.

Response to application of molybdenum on Moutere soil at Redwoods Valley, Nelson. The dark strips are the treated areas.

Responses were not noticed until the peas were 2 months in the ground; that is, until the nodules were formed. The nodules on the untreated peas were inclined to be grey and small; on the treated plots they were much larger and pink. This has been observed frequently overseas and agrees with knowledge here that the main response of leguminous plants to molybdenum is due to the increased nitrogen fixing activity of their symbiotic root bacteria (which fix nitrogen from the air).

The lesions at the bases of the stems caused by the collar rot group fungi were larger on the untreated peas. Though definite figures were not available, treated peas gave a higher yield and matured about 2 days later and "held" better than the untreated ones.

## Worthwhile Results

It appears that molybdenum is necessary for peas and that by its judicious use on molybdenum-deficient areas worthwhile results can be obtained. Peas are known to accumulate relatively large amounts of molybdenum in their seed, however, and if seed is harvested on soils which contain sufficient available molybdenum, it will in most instances contain enough of this element to produce healthy plants even if sown on soils extremely short of available molybdenum. Whether peas will respond to the application of this element will therefore depend not only on the soil in which they are grown, but on the source of the seed. However, further work is required and to this end the Cawthron Institute and the Department of Agriculture are carrying out further experiments. It is suggested that producers should try molybdenum themselves on small areas to decide whether it is applicable to their farms.

# Seedling Rootstocks for Apples in Papanui District

**SEEDLING rootstocks for apples are being used to quite a large extent in plantings and replacements in the Papanui district. In this article M. G. Baumgart, Assistant Storage Specialist, Department of Agriculture, Wellington, describes their propagation and uses.**

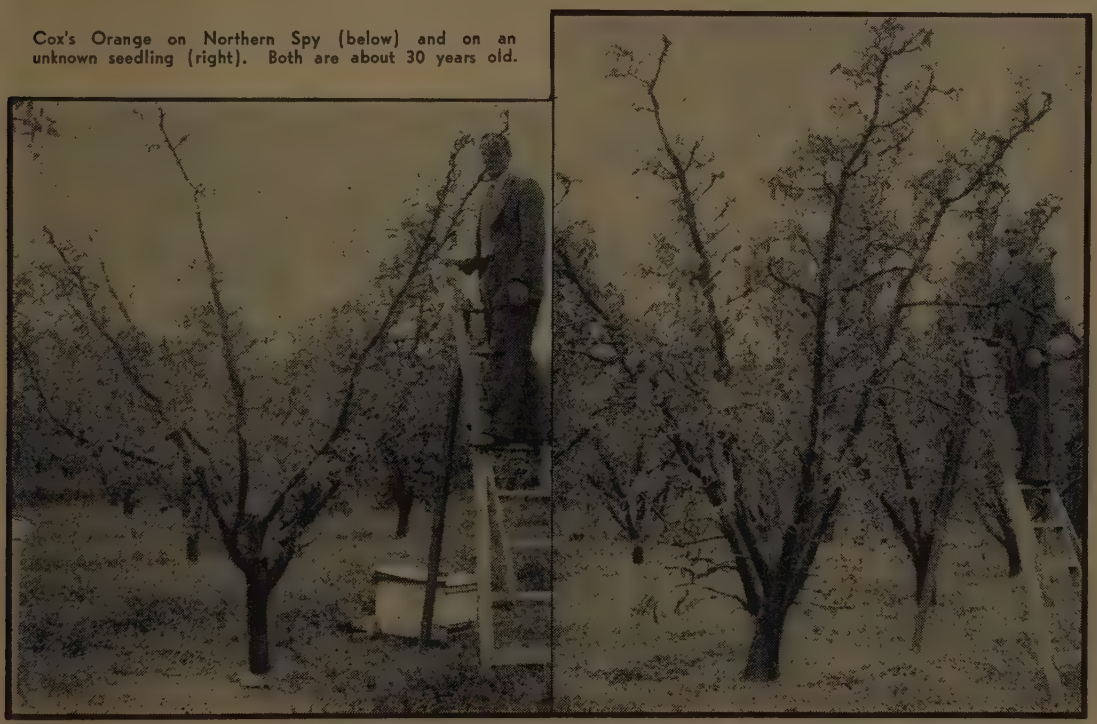
EARLY plantings of apples in the Christchurch district were mainly of trees imported from Australia and England and those propagated by growers. The greatest proportion of these trees were on seedling stocks, and though a number of these trees are still growing in the district, their parentage is not known. Later, seedlings commonly used were mainly of the variety Winter Majetin and a few other varieties.

When woolly aphis (*Eriosoma lanigerum*) became a serious pest most of the nurseries ceased production of seedling stocks, as they were very susceptible to this pest, and concentrated on the production of trees on the resistant Northern Spy stock.

After some years it became apparent that Northern Spy was not vigorous enough under local conditions for several of the varieties grown, but it was not until the woolly aphis parasite (*Aphelinus mali*) had become well established that the tendency to return to seedling stocks took place.

Cox's Orange Pippin on seedling stocks.

Cox's Orange on Northern Spy (below) and on an unknown seedling (right). Both are about 30 years old.



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Sturmer on Northern Spy (left) and on an unknown seedling (right). Both trees are about 35 years old.

It is only within the last few years that the vigorous clonal stock E.M. XII has become available to growers, and it is being used to a limited extent in the Papanui district. Until this new stock has proved itself for local conditions many growers prefer to use the seedlings, as these have proved suitable.

Clonal stocks of E.M. XII produce trees of even vigour and similar cropping habits; seedlings would be expected to show great variations in both these aspects. In practice variation in the seedlings does not appear to be a serious drawback. One grower in particular budded any seedlings which appeared in the orchard, and the trees which have been developed on these stocks of mixed parentage are remarkably even in size and habit.

At present the most commonly used stocks are Lord Wolseley and Sturmer Pippin. Both these varieties appear to produce a high percentage of vigorous seedlings, and those from the coloured varieties used by these growers seem to produce more variable growth in the first year.

It appears that the first season's growth of the seedlings is quite a good indication of their future behaviour, and rogueing should be done before budding, the weakest and the strongest seedlings generally being removed.

## Seed Saving

Seed should be taken only from selected healthy trees. Two methods are usually adopted for saving seed, both giving a good proportion of viable seed. The first is to cut the seeds out of fully mature fruit and keep them in damp sand in a cool place until about 1 week before sowing. Then the seed, still in damp sand, is kept in a warm place such as a hot-water cupboard to help it to begin germination.

The second method is to allow mature fruit to rot completely in a wooden cask in a cool place. The fruits rot more rapidly if they are cut or damaged. A week before sowing, the seed is washed out, put in damp sand or blotting paper, and put in a warm cupboard to start germination. The warming period should not be longer than a week or the seeds will produce sprouts which may be damaged at sowing.

Most important is to prevent the seed from drying out at any stage, as it has been found that if it is allowed to dry, germination is often postponed until the second year.


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273 The Construction of Cherry Enclosures.
Bladder Plum and Its Treatment.

The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.


## Sowing

After the warming period the seed is sown in the position the trees will occupy in the nursery row. In light soils the seed is sown directly in the soil, but in heavier soils the drill is partially filled with sand; then the seed is sown and a thin covering of sand is spread over it before the drill is filled with soil.

The usual sowing time is from the middle to the end of August. The seed is usually sown 2in. to 3in. apart in rows 2ft. to 3ft. apart.

Under normal conditions seedlings appear in from 2 to 3 weeks.

## Selection

Before budding, the seedlings are rogued for removal of those which have not developed into strong upright rods and any that are showing abnormal characteristics. Exceptionally vigorous seedlings are also removed, as it is considered by growers that with many varieties these very strong seedlings may produce trees which are difficult to bring into bearing at a reasonable age.

One grower producing trees for his own orchard selects even further and at budding he works strong scion varieties on weak seedlings and weak scion varieties on strong seedlings. In this manner he has developed an orchard with a wide range of varieties which at 7 years of age all appear to have similar vigour, the heights of all trees being approximately the same.

## Budding

Budding is usually done in February and March on seedlings from the previous spring's sowing. Seedlings which are too small for budding this

first growing season are usually removed, but in a poor growing season some may be budded in the second year.

### Planting

It has been found that trees on seedling stocks make better growth in the first few years if they are shifted from the nursery rows to the position they will occupy in the orchard while they are still unbranched rods. This method does not result in as much root damage at lifting as would occur if the trees were left in the nursery a further year, and it is not necessary to wrench the trees.

### Advantages

In the Papanui district many soils appear to be too heavy and inclined to remain too wet for trees on Northern Spy stocks to remain vigorous over a number of years and they tend to become stagnant and very liable to be killed by bark-rotting fungi.

Trees on seedling stock in the same orchards and under the same conditions appear to remain vigorous and capable of producing good crops.

For the weaker scion varieties such as Sturmer and Tasma they form larger trees which carry heavy crops of good-quality fruits. It appears that the fruit from the vigorous seedling stock Sturmer trees are less susceptible to ripe spot (*Neofabraea malicorticis*) infection.

Seedling stocks give the trees a greater life expectancy and a heavier cropping capacity under local conditions.

### Disadvantages

The variability of seedlings and the consequent necessity of heavy rogueing make it imperative for a grower wanting trees on seedling stocks to grow his own trees or obtain them from a reliable source.

Slowness of coming into bearing could be a problem in some areas, but under local conditions and with care in pruning in the early years there appears to be little difficulty in bringing into bearing shy-bearing varieties such as Cox's Orange Pippin at normal age. One orchard planted entirely on Lord Wolseley Seedlings 4 years ago is producing an average of 1 bushel per tree, which compares more than favourably with plantings on Northern Spy stocks.

Very large trees are considered a disadvantage where land is relatively cheap, but in the Papanui district the object is to produce as large a crop as practical off a small area, and large trees appear essential.

### Recommendations

As there is a greater chance of variation in seedling stocks than in clonal stocks from stool beds, the Horticulture Division favours the use of the vigorous E.M. XII stock where trees are obtained from nurseries. It is expected that this stock will prove suitable for areas like the Papanui district, but at present the few trees on this stock are not old enough to have given a fair indication of their behaviour. Where a grower is prepared to grow his own stocks and be sufficiently careful in rogueing, seedlings have proved themselves suitable for the heavier land in the Papanui district.

# Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during October as follows:—

**1XH Hamilton, 12.33 p.m.**

4 October—"Meat Inspection", by J. H. Carrodus, Meat Inspector, Department of Agriculture, Hamilton.

11 October—"Silage Making", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

18 October—"Producer Meat Control in the Meat Industry", by M. G. Hewitt, Federated Farmers, Hamilton.

25 October—"Quality Faults in Milk and Cream", by J. B. Cockerton, Special Inspector, Department of Agriculture, Hamilton.

**1YZ Rotorua, 7.15 p.m.**

14 October—"Silage Making", by G. A. Blake, Instructor in Agriculture, Department of Agriculture, Matamata.

28 October—Young Farmers' Club talk, by Matamata district committee, Federation of Young Farmers' Clubs.

**2YZ Napier, 7.10 p.m.**

26 October—"Pre-seasonal Hints to Fat Lamb Farmers", by J. H. Thornton, Supervising Meat Inspector, Department of Agriculture, Napier.

**2XA Wanganui, 8 p.m.**

7 October—"For the Countrywoman", by Mary MacDonald.

14 October—"The Radio Vet.", by S. Jamieson, Veterinarian, Wanganui.

21 October—"The Meat Inspection Service", by W. F. Sears, Meat Inspector, Department of Agriculture, Wanganui.

28 October—"Summer Fattening Crops", by A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui.

**3YA Christchurch**

4 October (12.20 p.m.)—"Calf Rearing", by B. Grindell, Livestock Instructor, Department of Agriculture, Kaikoura.

7 October (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

**4YA Dunedin, 9.15 p.m.**

6 October—"Farming in South Otago"—discussion between farmer and J. G. Richards, Department of Agriculture, Dunedin.

13 October—"Silage"—discussion between Extension and Livestock Division officers, Department of Agriculture.

**Regular Sessions**

**1XH Hamilton**, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

**1XN Whangarei**, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

**1YA Auckland**, Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m., Saturdays at 6 p.m. (Auckland stock market report).

**1YD Auckland**, Thursdays at 7.30 p.m.

**1YZ Rotorua**, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

**2XA Wanganui**, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

**2XG Gisborne**, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

**2XN Nelson**, Thursdays at 8 p.m.

**2XP New Plymouth**, Thursdays at 8.1 p.m.

**2YA Wellington**, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

**2YZ Napier**, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

**2ZA Palmerston North**, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

**3XC Timaru**, Mondays at 8 p.m., Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

**3YA Christchurch**, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

**3YZ Greymouth**, Thursdays at 12.33 p.m.

**4YA Dunedin**, Wednesdays at 7.20 p.m., and 9.15 p.m., Thursdays at 12.33 p.m.

**4YZ Invercargill**, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

# Rush Control by Use of Hormone Weedkillers

WHEN the use of hormones for controlling rushes is considered there are two important points to be kept in mind. The first is that there are several species of rushes present in this country, some of which can be readily killed but others of which are very much more difficult to control. It is therefore most important for a farmer to have the particular variety of rush infesting his property identified. This may be done through his local Instructor in Agriculture, who will also be able to tell him whether or not the particular species is vulnerable to hormones. Secondly, it must be remembered that rushes are primarily a weed of poorly drained areas and that permanent rush control depends on the improvement of drainage to remove the excess water responsible for the rushes in the first place.

As far as the use of hormones in rush control is concerned, experimental evidence indicates that the following procedure should be adopted.

1. The rushes should be mowed in November and sprayed when the regrowth is still soft; that is, when it is about 18in. high. This is normally in the following January.
2. The spraying of the stumps of freshly cut rushes or of uncut rushes is not generally recommended.
3. The most efficient hormones appear to be either the ethyl ester or amine salt of 2,4-D applied at 2lb. of acid equivalent per acre. Rates of under 2lb. of acid equivalent per acre are not recommended.

One of the features of rush control with hormones is the slowness of the kill, which normally takes several months. This is an advantage, as it means that the dying clump is gradually replaced by pasture species and no bare patches are left in a sward.

—*A. V. ALLO,*
*Instructor in Agriculture,*
*Department of Agriculture,*
*Tauranga*

# Breaking-in a Horse

**THE horse-lover who follows the system set out in this article by J. A. Miller, Livestock Instructor, Department of Agriculture, Blenheim, can transform a timid, untamed animal, possibly dangerous to handle, into a docile, friendly, and affectionate helpmate. The essentials are gentleness, unlimited patience, complete confidence, and always, from the earliest stages, insistence that the horse trainer is the master.**

THE term breaking-in a horse could well be altered to training the horse, the old method of roping, saddling, and riding the animal to submission having long been abandoned, as the horse so treated has often proved ill mannered and untrustworthy for all time. The horse that has been quietly trained is usually friendly and reliable. The temperament of the trainer is also often reflected in the horse; the man with a loud, high-pitched voice and nervous actions often makes the animal nervous and scary. The trainer must be able to control his own temper, his movements, especially those of his hands, and his tone of voice if he is to handle nervous, high-spirited horses successfully.

The horse identifies its training by sight, smell, hearing, and feeling, the first and last senses being the chief ones and those to which man must give consideration. It is inadvisable to move suddenly around a young horse, place the hand nervously on it, or speak to it in a high-pitched, nervous voice, as most animals become nervous, and fear being in most cases the cause of viciousness, the horse can quickly qualify for the description of outlaw through the fault of the trainer. Very few horses are bad by nature, but some breeds are tricky and vicious and have to be handled very firmly.

## Initial Handling

It is advisable to yard the animal in a strong yard approximately 30ft. square with walls 10ft. high. This area permits space for handling and also gives the trainer room to dodge the rush of a striking horse. It is well to remember that many horses when handled initially use their front hoofs to strike and that they are equally as dangerous with front as with hind feet.

The animal should be yarded and left to cool off, if warm, and the necessary gear should be placed in a convenient position. For initial handling it is usual to have two ½in. diameter ropes approximately 24ft. long, one ⅜in. rope of the same length, and an 8ft. x ¾in. halter, leather headstall, mouthing saddle and bit, crupper, and one short strap 18in. x 1½in. with a buckle.

The horse should be approached quietly, spoken to quietly, and allowed to get used to the trainer walking slowly around. It may be possible to place a hand on the animal and to rub it gently on the forehead and between the eyes. The centre of the forehead is a good place to touch first and this action is not as likely to be received by a front hoof as is the rub on the nostrils, ears, eyes, neck, or shoulder, but the nervous animal must be watched for the front hoof strike.

A very nervous horse can be stroked gently over the body with a long light stick until it settles down. A rope with a loop can then be placed on the stick, the loop worked gently over the head of the animal, and the stick removed. The rope is then tightened and the horse pulled sideways for a while until it becomes used to and answers the pull of the rope. Care is needed in the use of the looped rope, as holding it too tight will choke the animal and may injure the throat. The strain must be released when the horse shows signs of choking.

A lasso is very useful for catching young horses and can be fairly accurately thrown after a little practice. A loop of approximately 4ft. diameter is a suitable size for this work, but it can be enlarged to suit the operator. A knot on the lasso so that the loop cannot tighten fast lessens the risk of choking or injuring the horse.

After being pulled around sideways for a while the animal ceases to struggle against the strain of the rope and will stand for the headstall to be fitted. The animal should be shown the headstall and permitted to smell it before it is adjusted. It is advisable to rub the head gently, particularly around the ears and eyes, before the halter is placed over the head to allow the animal to become used to the feel of movement and hands around its head. It is necessary to watch for a striking front hoof when the halter is being fitted and many horses will attempt to remove the halter with their front feet after it has been fitted, with consequent injury to their heads.

## Fitting Headstall

A leather headstall without brow band (Fig. 1) is preferable, as it is easily fitted. A light rope can be tied to a D in the centre of the nose band (Fig. 2) to give good control. The iron D must be placed on the outside of the nose band and kept in place by another short piece of leather sewn on to the nose band. The nose band can be tightened if the headstall is fitted with a buckle at the side (Fig. 3), giving better control over the animal. The horse can then be pulled around and made to turn in a circle. It will soon answer the pull of the rope and follow the trainer.

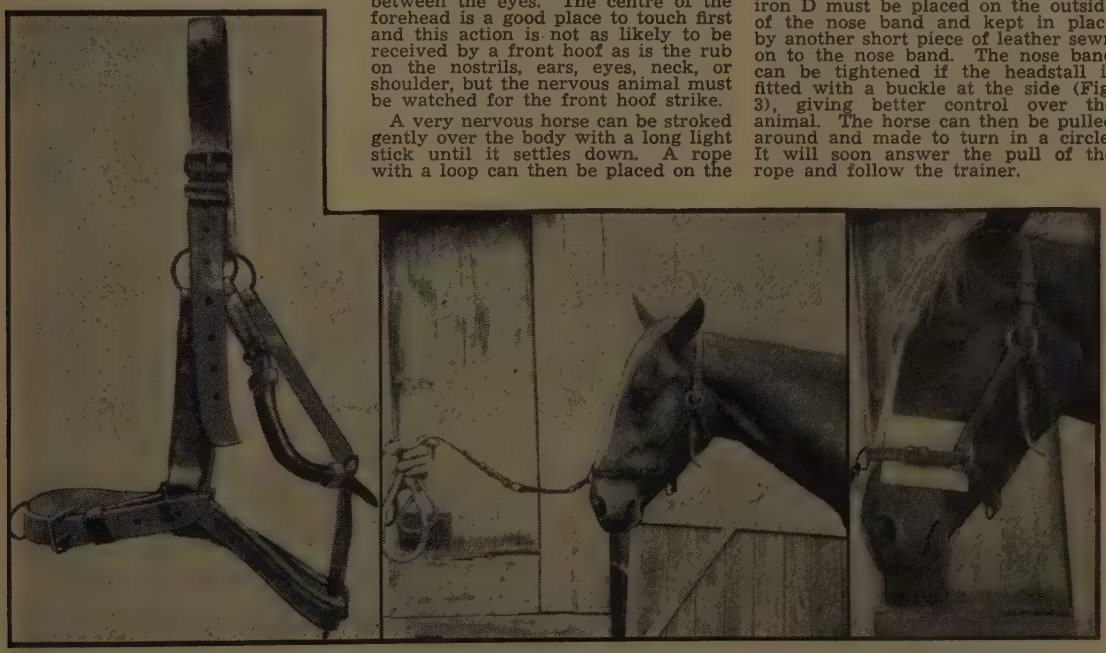

Fig. 1 (left)—Headstall. Fig. 2 (middle)—The light rope to the nose band. Fig. 3 (right)—Buckle for tightening headstall.

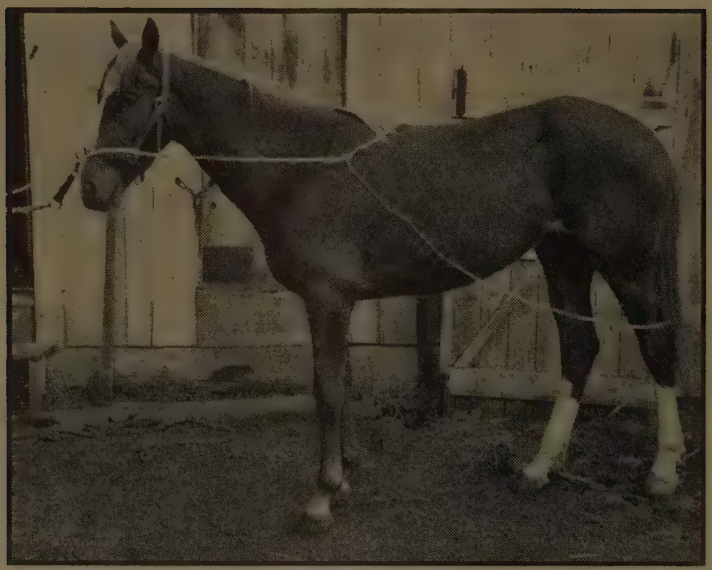

Fig. 4—The breech leading rope.

All pulling must be from the side of the horse and not from straight in front. When the animal is turning to one side and completing the circle it should be taught to turn to the opposite side and circle in that direction. As it is impossible for one man to pull a horse straight ahead or hold it when it decides to run backward, there is little point in doing so; the quickest way to stop an animal running backward is to let the rope slacken off. Pulling the animal straight ahead, as in leading, is of little use unless done in conjunction with the use of the breech rope, when the strain should be put chiefly on the breech rope.

A light rope can then be doubled at one end with a loop 4ft. long and the loop placed over the rump of the horse, the bottom of the loop being allowed to hang down to the hocks (Fig. 4). The single end of the breech rope is retained in the right hand of the trainer. A tug on it will jerk the animal above the hocks and induce it to move forward; repeating this will readily induce the animal to lead. The lead rope from the halter should be retained in the left hand and it is advisable for the trainer always to move round with his face toward the horse so that a rush and sudden strike or kick can be avoided.

It is common practice at the next stage to tie the horse up and let it "pull its head off"; this is a mistake, as the animal will not struggle and pull so much if the tying up is left until it has been well handled and has confidence in the trainer. The final result is also better, as the animal does not pull back later.

## Handling of the Legs

The next procedure is the roping and handling of the legs. The short strap is attached to the 24ft. long ½in. rope and the strap with rope attached is slid over the horse's back behind the withers, lowered to the ground on the off side, caught with a hooked wire, drawn through under the belly to the near side, and buckled round the near pastern. The strap encloses a portion of the same rope which hangs from the withers on the near side (Fig. 5).

The end of the rope is pulled tight and the near foot is taken up with the tension. The rope can then be tied near the shoulder and the animal cannot draw the foot away or place it on the ground (Fig. 6). On hard ground

Fig. 5—Rope on front foot.

Fig. 6—Front leg up.

knee pads can be fitted to protect the knees in case the horse lunges and comes down on these joints.

It is next necessary to handle the leg and stroke the horse around the body, speaking to it quietly and moving steadily so that it can become accustomed to the closeness, touch, and movements of the trainer.

The first step in lifting the hind legs is to loop the 8ft. rope around the neck, the bottom of the loop to be just below where the windpipe enters the chest. This rope must be securely knotted (Fig. 7). One of the 24ft. x ¾in. ropes is bound with 1ft. wide flannel or soft cloth approximately 18in. from one end and this end is placed through the looped neck rope from the front near side, taken down between the front legs to the near hind leg, and looped around the hind leg below the hock, the flannel being behind the leg and a bowline knot in front (Fig. 8). The other end of the rope is then brought up through this loop, brought to the front neck loop, and pulled firmly enough to take up any slack (Fig. 9).

The front leg can then be lowered by unbuckling the strap and the hind leg lifted by pulling the heavier rope.

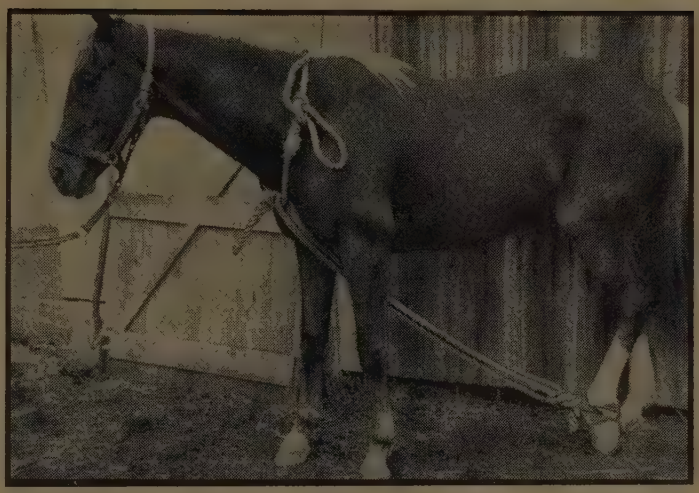

Fig. 8—Hind leg rope in position.

Fig. 7—Neck rope for hind leg lift.

It is advisable to stand in front of the horse and pull steadily until the foot is a third of the way between its normal position and the shoulder (Fig. 10). This leg can then be handled without much danger of the animal kicking. It must not be assumed that the animal cannot kick with the other hind leg while in this position, as it is quite possible and has happened on many occasions, the horse regaining balance on the free hind leg.

The off legs can be handled in similar manner to the near legs. It will be found easier for the first roping to place the rope in position on the horse on the next leg to be lifted before the hind leg being handled is released.

In later handling it will be necessary to take the legs into the positions required by the blacksmith when shoeing, to tap the hoofs with a hammer, and to rasp the hoofs or generally to make movements and sounds similar to those made by the blacksmith with his tools when shoeing. This gives the smith an opportunity of shoeing the animal quietly, as it then understands the noise and movements and has confidence in the operator. It is advisable after having roped all legs to let the horse have freedom in the yard for 4 hours or so with a good supply of water, cut green feed, and small amount of chaff.

## Training Repeated

Leading should then be repeated around the yard until the horse leads smartly and freely. The handling of one or two legs can be undertaken again and it will be found that it is easier on this occasion to secure all ropes; also legs will lift more readily and the animal will not struggle as previously. This constitutes a day's handling and it is advisable to give the animal only the amount of training that it can understand; in this,

Fig. 9—Hind leg rope with slack taken up.

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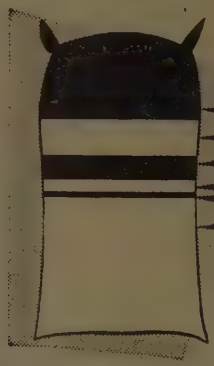

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the sulky horse is better freed from ropes and given a spell for a day or so. It will be found that the animal will improve from the spell.

When the horse is first led from the yard it is necessary to watch carefully for its first attempt to pull away and escape. This can be thwarted easily by several good side pulls on the lead rope.

## Mouthing

Mouthing can be begun on the third day when the animal is more tractable and is usually less inclined to resent gear and fitting. All gear can be fitted while a front or hind leg is tied up, as this causes the animal to stand for the fitting.

The mouthing saddle is a light saddle similar to a surcingle padded on the under side where it fits over the back. A crupper is attached and a short strap with a 1½in. or 2in. ring leads off toward the withers. A rope rein runs through the ring to each side of the bit and is attached to the bit ring with light tension only (Fig. 11). The ring permits the tension to be equal on each side of the mouth. The mouthing bit is better attached to an open bridle than to a headstall and the addition of a front piece (Fig. 12) holds the bit forward and up in the horse's mouth and prevents the animal from acquiring the bad habit of getting its tongue over the bit.

The front piece is a strap buckled to the centre of the top head strap between the ears. It runs down the forehead, divides between the eyes, and buckles on to the bit rings on each side. A light mouthing bit (Tom Thumb type) induces the horse to work the mouth and tongue and to take a light strain on the rein. A Tom Thumb bit prevents the horse from getting the bit too far to one side of the mouth and gives better control for turning when the first driving lesson begins.

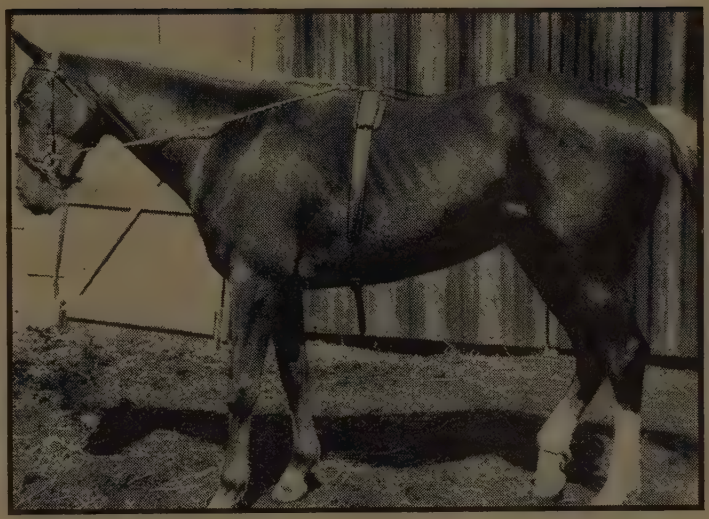

Fig. 11—Mouthing gear fitted.

The mouthing bit should be carefully cleaned after being removed from the mouth, as stale saliva and part chewed feed, etc., accumulate near the side and the deposit when hard tends to chafe the mouth. A light application of petroleum jelly to the upper corners of the lips after removal of the mouthing bit keeps the mouth softer and prevents scalding. Scalding or breaking the skin of the lips causes hardening of the mouth later.

One hour's mouthing daily for 3 days, with more tension on the rope rein on the third day, is sufficient to prepare the horse for driving. Light ropes or reins can then be attached to the bit and taken through rings or loops fairly low on each side of the mouthing saddle (Fig. 13). This gives control and at the same time prevents the horse from throwing its head up too high when being driven.

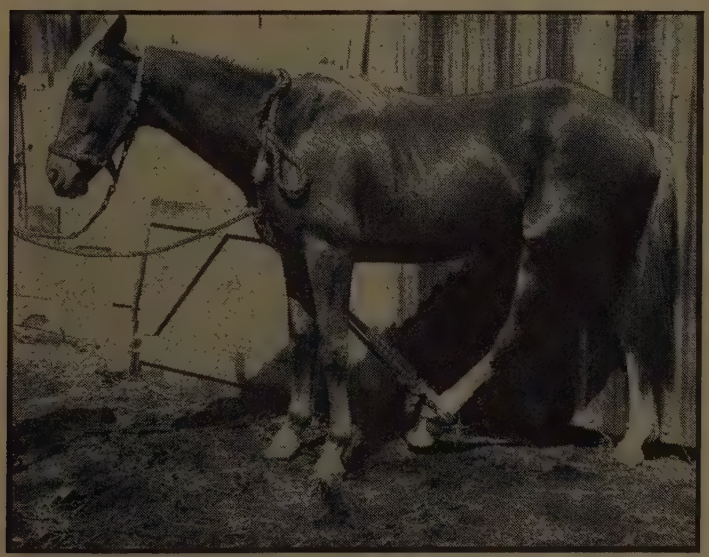

Fig. 10—Hind leg up.

Fig. 12—Front piece.

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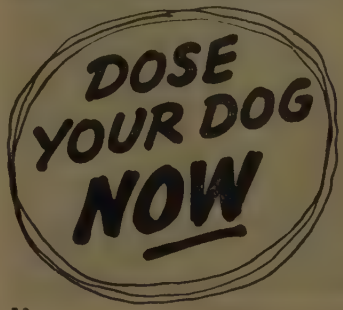


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## Driving

The driving of the animal requires a very gentle hand on the rein and the owner must remember that the horse must learn to stop gradually. The hard, heavy pull on both reins with a simultaneous loud "whoa" only frightens the animal and causes it to fight and injure its mouth.

Tension on either rein with corresponding flick on the hind quarter with the other will soon induce the horse to turn as desired, and steady light tension on both reins with a low spoken "whoa" will soon cause it to stop. A corresponding steady strain on both reins from straight behind the horse with a gentle "back" command will soon cause it to back and this is most important, as it will be found that the horse that cannot be backed on the rein likewise cannot be stopped when required and is not correctly mouthed. The horse should be driven in every direction, past stationary objects, fast traffic, etc., stopped and made to stand, turned in every direction, and generally driven as required in saddle or harness.

The saddle horse must be taught to stand for mounting and the near hind leg is pulled up as in Fig. 10 so that the animal is compelled to stand. If the trainer mounts the horse quietly from first one side and then the other and slips off over alternate sides and the tail, the horse becomes used to the movements and to the weight of a man on its back. When mounting, the rider should not "stick the toe" into the ribs of the horse, as such carelessness is likely to make it frightened and difficult to mount.

Mounting procedure should be practiced for several days. With a horse intended for stock work it is advisable to walk round the animal cracking a whip (the leg must be tied up) and then mount and crack the whip.

**Care must be taken to see that the whip does not strike the horse.**

The first noise will frighten the animal and it will struggle, but as the cracking continues the struggles cease and the horse stands quietly and confidently and realises that it is not being hurt in any way—again, the lash must not hit the horse or it will lose confidence and become nervous.

The saddle or any harness, cover, ropes, vehicle, or any other equipment can be introduced to the animal when a leg is tied up. It should be allowed to see and smell all gear, the jogger or cart can be pushed up to it, the shafts rested on the back, and the boards rattled to show the animal that it will not be hurt by any of these things. The operator should always speak quietly and kindly to give the horse confidence.

The saddle or harness can be placed on the back, taken along the neck over the sides and tail, put on and off several times, and shown frequently to the horse to smell. It can then be fitted on, girthed firmly with the crupper in place, and the animal allowed to exercise in the yard until it becomes familiar with the feel of all harness and other gear.

Leading the young horse with harness on, from another hack, around roads, through traffic, and in various other places permits the young horse to become used to unusual sights and sounds, tires it somewhat, and saves much work later when it is ridden or driven by itself. A lead rope is placed through the bit ring on the off side from inside, taken over the head behind the ears, through the bit ring on the near side from outside, and knotted to itself fairly tightly up to both bit rings. A light rope for leading (Fig. 4) is taken also and with this the young animal should be made to lead beside and not behind the hack.

Fig. 13—Driving reins.

The lead rope on the head gives effective control and the breech rope, if effectively jerked, will prevent the young horse from lagging. The animal should be led first on the off side of the rider and then on the near side, weight being placed on the saddle with the hand as the horse leads close beside.

## Riding

A saddle horse can then be ridden and, if the animal has been well handled, this is not the "sticky" part. The horse that has been led as mentioned can be mounted quietly, allowed to stand for a time and then moved off beside the hack, with or without rider, and then induced to move ahead and to one side of the hack, and finally ridden around the yard by itself. It is advisable to take the animal around a block or area and return to the starting point by one continuous circuit without stopping and turning back, as turning back sometimes induces the horse to attempt to repeat this action on other occasions.

The horse should then be ridden daily until it is quiet and confident in traffic, with dogs, and in all the usual circumstances. A long trip at walking pace tires the animal without injury to its tendons or feet. The fore feet may be shod at this stage.

The horse can then be tied up to a tree or a very strong post where there is no possibility of its being injured if it struggles or throws itself. One end of a ¾in. rope should be put through the offside D on the side of the leather halter from inside, taken up the off side of the head, over the neck behind the ears, down the near side, through the near side D on the halter from the outside and tied to itself with a bowline knot short up under the jaw (Fig. 14). The other end of the rope can then be placed around the tree about 4ft. from the ground and all slack taken up until the horse has approximately 4ft. of rope for movement.

The tie-up rope can then be secured and the animal left to pull or otherwise as it wishes. If it does not pull, it is advisable to give it a fright from in front to cause it to pull and discover that it cannot break the rope and must stand. If it is allowed to stand quietly and some day later when it is tied by bridle reins it is frightened, the following pull may break the bridle reins. The horse will then always be unreliable. The horse must be mastered in tying up, but the lesson is nearly learnt if tying up is left until this stage of the training.

## Harness Horse

A harness horse should be prepared in the same manner as a saddle horse. When mouthed it can be fitted with harness, traces can be attached to collar and breeching (with all slack taken up), and the horse permitted to walk around the yard for an hour or so. Light rope reins can then be attached for driving, the ends of two light 10ft. poles can be fitted in tug loops on the harness saddle, and the animal can be driven around the yard and turned as if it were in a cart by

Fig. 14—Tie-up rope fitted.

the driver taking the other ends of the poles under his arms. This system permits the horse to become used to the feel of the poles along its sides before it is put in the cart.

The back end of the traces can then be freed from the breeching and a light rope attached to them. Slight tension put on this rope by the driver or an assistant and increased gradually as the animal is driven round permits it to become used to pulling and goes a long way toward reducing trouble when it is first yoked in a vehicle. Next the animal can be yoked up and can be made to stand quietly by the pulling up of a hind leg as in Fig. 9. The leg is released, ropes removed, and the horse driven around (preferably in a flat, even paddock). It is advisable to fit a kicking rope over the rump slightly above the root of the tail and to attach the centre to the breeching ring near the top of the rump and fasten each end securely to a shaft at the side. This will prevent the horse from getting a hind leg over the shaft if it does kick. A leather cradle is sometimes used for this purpose.

The trainer should get into and out of the vehicle before the horse is moved off to get the animal accustomed to standing quietly. The horse should then be driven quietly round, induced to stand quietly at different places, and driven back to the starting place by a continuous circuit if possible. When the horse is being trained to turn it is advisable to permit plenty of room, to take a wide turn, and not to frighten the animal by making an abrupt turn with the horse labouring to push one shaft around while the other tightens across its rump and causes it to kick.

To stop the horse, the command of "whoa" should be given clearly and quietly before a steady, gentle pressure is put on the reins. A sudden halt, with loud "whoa" and strong pull on the reins, injures the mouth and causes the breeching to tighten suddenly with the impetus of the vehicle, and the horse's reaction is to crouch up quickly and kick. Slow driving tires the horse; it becomes less easily startled and more accustomed to the vehicle behind it. An open bridle should always be used at first so that the horse gets accustomed to the sight of the cart. The horse broken in with blinkers bolts very quickly if later on it loses its blinkers when yoked in the cart. The backing of the horse in harness is done in the same manner as with the saddle horse, and after being driven, stopped, and backed it soon becomes very quiet and useful.

### Rubbing down

A sweating horse should not be left in the cold to chill, but should be rubbed down with a dry cloth or a hay or straw wisp, particular attention being paid to the places where saddle or harness has rested, and left in a stable to cool off with a sack or rug over the loins. The good horseman does not bring back a sweating horse if it can be avoided, but permits the animal to cool off in the last mile or two of the journey to reduce the risk of its getting a chill through standing in the cold and so that it is ready to eat when it arrives.

Feeding and watering of the animal are better left until it cools off. To permit a hot horse to drink a lot of cold water or have a heavy feed of chaff tends to cause digestive upsets.

Horses vary in temperament; most of them respond to kindness and good treatment, but quiet firmness is also always necessary with all of them. The occasional animal has a bad nature and takes much mastering and is sometimes of little use to anyone except the person who has been able to handle it. In the main kindness with firmness will pay handsomely to the person who requires a reliable, tractable saddle or harness horse.

# Improved Design for Tailing Yard

THE careful farmer always erects his tailing yard on clean ground to obviate the risk of infection. An improved design of tailing yard used by a Lowcliffe farmer which has several advantages over the conventional type and which is no harder to erect is described below by R. Inch, Fields Instructor, Department of Agriculture, Ashburton.

THE main principle is provision for drafting all the lambs from their mothers before tailing begins instead of following the usual practice of yarding both ewes and lambs into the crush pen as the work goes on.

Advantages are:—

1. Easier yarding. The sheep have a straight run through instead of being forced against a dead end.

2. Lambs in the crush pen can be caught readily without the operator having to push through a packed pen of ewes.

3. Ewes do not tramp and soil the pen badly, but disperse over the paddock immediately.

4. Lambs do not congregate around the pen, where it is usually very dusty.

5. As the ewes are all out in the paddock waiting for their lambs, mothering takes place immediately the lamb is released.

The yard is built to accommodate a flock of 150 ewes, but it can be altered to suit requirements. The size of the main pen is approximately 6yds. x 16yds., and the catching pen is 4 or 5yds. in diameter. The catching pen is surrounded with old sacking or hessian taken from the outside of cornsack bales. This is essential, as it prevents the lambs seeing out and thus keeps them quieter.

# Increasing Humus Content of Central Otago Orchard Soils

**FRUIT growing in Central Otago differs from that in other parts of New Zealand mainly because of the district's low average rainfall—from 10in. to 24in. annually. Conservation of soil moisture is therefore of vital importance to fruit production. The moisture-holding capacity of humus is well known, and in this article D. W. Wilson, Horticultural Instructor, Department of Agriculture, Roxburgh, describes other beneficial effects and methods of increasing the humus content of orchard soils in Central Otago.**

MOST of the Central Otago orchard soils are light, of mica schist origin, low in humus, and contain varying amounts of unweathered rock. Much of the subsoil is of a free-draining gravel. The moisture-holding capacity of such soils is low, and even in the higher-rainfall areas much rain is of little value because of this low moisture-holding capacity. To obtain the maximum benefit from rain and in many cases irrigation water it is necessary to increase the soil humus content.

Humus can be added to the soil by any of the following methods:—

1. Allowing weed growth to develop.

2. Growing cover crops.

3. Making applications of hay or straw.

In addition to increasing the moisture-holding capacity of soil the desirable properties of humus are:—

Increased nutrient holding capacity.

Improvement of soil structure and aeration.

Improvement of soil drainage (this has little application in Central Otago except in isolated areas).

It aids better water penetration whether by rain or irrigation.

On sloping land it reduces the amount of surface run-off and erosion.

## Cultivation

The general cultivation programme in the area consists of either autumn and spring discing or rotary hoeing, or spring discing or rotary hoeing only. After a reasonable tilth has been obtained shallow cultivation sufficient only to suppress weeds is maintained to December, thus obviating competition between fruit trees and weeds for available soil moisture. Even where adequate irrigation water is available it is the normal practice to clean cultivate until December, as heavy weed or cover crop growth provides conditions suitable for the

HEADING PHOTOGRAPH: An orchard area at Coal Creek, near Roxburgh, in Central Otago. The Clutha River is in the foreground. Note the orchards on the hillside.

This oat crop is being grown to mulch the orchard in the background.

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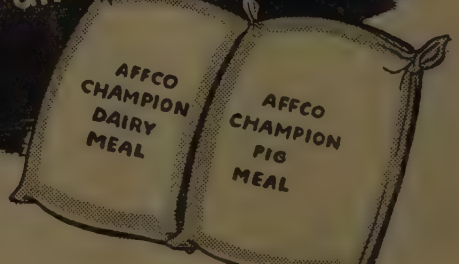


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development of disease. This applies particularly to stone fruit orchards.

## Weeds

Where cover crops are not grown it is the usual practice to allow weeds to come away in autumn. The growing season in Central Otago is comparatively short, and the bulk of organic material obtained, though valuable, is generally not sufficient to increase the humus content of the soil appreciably. Weed growth is turned in in late autumn or before bud movement in spring.

## Cover Crops

Where cover crops are grown they are sown about mid-January and turned in either in late autumn or early spring. They are rarely sown earlier, again because of the competition for available soil moisture and the danger of disease.

The main cover crops grown are oats, black barley, ryecorn, and blue lupins, sown at 1½ to 2 bushels per acre. The crop should be one that will produce the greatest bulk of material, and in the short growing season in Central Otago oats or black barley have proved the most satisfactory. Though blue lupins are a legume and add valuable nitrogen to the soil, the amount of organic material produced is generally small. To assist in the early establishment of a cover crop it is advisable to apply superphosphate or a similar fertiliser at 2cwt. per acre at the time of sowing.

In many of the older orchards, even though adequate water is available, cover crops do not thrive. This is due to the fruit trees' excessive shade retarding cover crop growth.

A cover crop or any organic material should be cultivated in sufficiently early for it to be well decomposed by bud movement in spring, because if it cannot be turned in sufficiently early, there is a reduction in the amount of available soil nitrogen at this important stage of tree development. This reduction can be easily remedied by applying a quick-acting nitrogenous fertiliser such as sulphate of ammonia 10 to 14 days before bud movement.

Where there is frost danger it is essential that cover crops or weeds be turned in before bud movement, as the severity of frost is greater where the soil is covered by weeds or cover crops than where it is clean cultivated.

Hay spread out in a cherry enclosure, where plantings are usually close.

Hay laid out preparatory to being spread in an orchard.

## Hay and Straw

Because of the low rainfall and short growing season, the amount of humus added to the soil by weed growth or cover crops is rarely sufficient to affect to any degree the moisture-holding capacity of the soil. Humus is being continually lost from the soil, and though weeds and cover crops may be the means of maintaining a humus level, under most conditions they are not a means of increasing it.

The most satisfactory method of increasing the humus content is by the application of hay or straw. The method of application is governed by the quantity of material available, the availability of water, and the cultivating equipment used. The frost factor should not be overlooked.

If sufficient material is procurable, a permanent surface mulch can be used to advantage, and under this system cultivation is not necessary, but the mulch must be of sufficient depth to suppress weeds, and annual applications of the material are required to maintain the depth of mulch. Loss of soil moisture by direct evaporation is reduced to a minimum by this method.

Surface mulches are liable to induce surface rooting of the fruit trees, and if for any reason cultivation has to be resorted to, it should only be shallow; otherwise serious damage to roots may result. This system, known also as strawing down, has been tried for 6 years, and to date has proved very successful, crop production being substantially increased. At first 2 bales of hay per tree were spread, and to maintain the depth of mulch 1 bale per tree was spread annually. The

severity of frost is slightly greater than where clean cultivation is practised, and as frost fighting is costly, this is an important factor.

### Erosion and Run-off Reduced

On sloping orchards that are relatively frost free this method appears to be the most satisfactory, as surface run-off and erosion are reduced to a minimum and irrigation more easily practised. Where fire pots are used the fire hazard is not great unless fresh applications of dry material are made during or immediately before the frost danger period.

### Method of Application

The most popular method is to apply hay or straw either in late autumn or during winter, usually at ½ to 1 bale per tree. In orchards without irrigation autumn appears to be the best time to apply hay or straw. Though the severe winters retard decomposition, the material is sufficiently moist to be easily cultivated in and to allow the normal cultivation programme. Moisture is necessary for the decomposition of any organic material, and if the hay or straw is turned in moist, competition with fruit trees for available soil moisture in spring is reduced. The material may be applied at any time throughout the dormant period, and may even be turned under dry in spring provided the soil moisture content is sufficiently high or irrigation water is available to obviate competition for moisture.

To allow for subsequent shallow cultivation by a spring-tooth cultivator the material must be well incorporated in the soil. Use of the rotary hoe has proved the most satisfactory method of accomplishing this, particularly where the application of material is heavy or the material is dry at time of cultivation.

Where hay or straw is used heavy applications of nitrogen in addition to that supplied in the normal fertiliser application are necessary, as otherwise fruit trees are likely to suffer from a deficiency of this element. Sulphate of ammonia at 1½lb. to 4lb. per tree should prove adequate; for surface mulches the higher quantity is necessary.

### Value in Increasing Fertility

Growers are realising the value of hay and straw in building up the fertility of their orchard soils, and very satisfying results have been obtained, crop production having either been increased or maintained at a high level because of their use. As these materials are becoming more difficult to procure and more costly, growers with available land would be well advised to grow their own hay or straw and thus be assured of a continuous supply.

Weed growth increases after use of these materials, but this helps in the maintenance of a satisfactory humus level. Also, after the use of hay or straw cover crops have been grown successfully without detriment to fruit trees in areas where lack of water was previously a limiting factor in the growing of such crops.

# Development of Moutere Hills Country

**IN the Nelson district there are large areas of deteriorated hill country on the Moutere hills which are capable of being improved from a carrying capacity of 1 ewe to 3 or 4 acres to approximately 3 ewes per acre. In this article D. M. E Merry, Instructor in Agriculture, Department of Agriculture, Nelson, describes briefly the methods being adopted by a farmer to develop this class of country.**

THE area occupied by Mr. C. F. Shuttleworth is situated in the Wakefield district, and on the undeveloped slopes of the property the cover comprises mainly poor native pasture with considerable areas of gorse and manuka. In addition there are scattered seedling pine trees. On the sidelings the slopes are up to 25 degrees, with the steeper slopes running to approximately 35 degrees.

The soils comprise a thin topsoil of firmly packed silt which overlies deep, water-worn gravels. They are of low natural fertility and because of their physical structure can be worked only when moist. The presence of gorse on Moutere hill country is generally regarded with favour, as the land works up better then and is usually of higher inherent fertility.

### Provision of Access Roads

The first stage in Mr. Shuttleworth's development programme was the construction of access roads with a bulldozer. Preliminary clearing work is done with a scrub-bar attached forward on a powerful tracklaying tractor. This crushes the manuka and gorse and facilitates firing. Subsequently the larger pieces of undestroyed manuka and gorse wood are gathered.

The first discing is normally done in late winter, when the disc blades will penetrate the soil quite easily, and this heavy discing is followed by another in spring or early summer. This latter discing has the dual purpose of working the ground to a seedbed and completing the destruction of partly burnt rubbish. Deep ploughing is preferred on less steep country, as trash is then turned right under and there is not the problem of young gorse establishing from seed or reshooting from older roots imperfectly buried. Later working (discing and levelling) is done with ordinary tandem discs and a heavy leveller and clodcrusher.

A clearing crop is sown in the first autumn, but some farmers in the district fallow through a full season. Green Globe turnips are a popular first crop, though oats with lupins do well. Mr. Shuttleworth is using N.I.A.B. ryecorn drilled at 2 bushels per acre plus 1 bushel of Algerian oats. Superphosphate at 1cwt. per acre is sown with the seed. Ryecorn does well and makes a good recovery after grazing.

Usually two or more clearing crops precede final sowing and at this last stage application of lime at 2 tons and of superphosphate at 3cwt. per acre gives good results. Recent trials and and the experience of farmers indicate the superiority of molybdenum superphosphate in encouraging clovers and in turn pasture grasses.

### Pasture Seed Mixture

The pasture seed mixture is based on a dominant ryegrass-white clover sward to which short-rotation ryegrass is added to give quick establishment with cocksfoot for deep rooting and summer growth. Subterranean clover and/or a little cowgrass are useful, particularly in the early life of the pasture.

Giant discing can be done more cheaply than ploughing, but the opinion is held in Nelson that more working is required when heavy discs are used on gorse country and final costs are likely to be somewhat similar to costs incurred with ploughing.

On Mr. Shuttleworth's property the carrying capacity was approximately 1 sheep to 3 acres and the sheep were in poor condition. On the improved areas 3 sheep per acre plus cattle are run and they are doing well. There are large areas of similar Moutere hills country and the results achieved in this case show the potential productive capacity of the district.

HEADING PHOTOGRAPH: Development work on Mr. Shuttleworth's farm. The area on the right has been giant disced. The land on the left is typical of much of the unimproved country on the Moutere hills. The location of the farm is shown by the cross on the map. A. R. Kingsford photo.

# Summer- and Autumn-flowering Bulbs, Corms, and Tuberous-rooted Plants

DURING spring bulbs, corms, and tuberous-rooted plants are greatly relied on to give a bright display after winter. In summer, however, they are not used to the same extent, but can be utilised to give a contrast to other plants growing about them. In this article R. R. White, formerly Horticultural Instructor, Department of Agriculture, Dunedin, and K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch, discuss aspects of the growing of some of these subjects. Flower garden work for October is dealt with by M. Joanna Lockie, Horticultural Instructor, Department of Agriculture, Auckland.

BY use of bulbs, corms, and tuberous-rooted plants colourful displays can be made in the garden throughout summer and autumn. Because of their habits and requirements they can be used in different parts of the garden, whether they are shady or exposed to full sunlight.

Of summer-flowering bulbs lilies are the most loved for their beauty and fragrance, gladioli are the best-known corms, and dahlias the most used of the tuberous-rooted plants. A number of other plants in these categories are useful in borders and rockeries.

## Lilium

The lily is a member of the family *Liliaceae*, and about 300 to 400 species have been described, though modern botanists consider that fewer than a hundred are entitled to specific rank. Many flowers are mis-named lilies.

1

2

1—Lilies show to advantage if planted in groups in semi-shaded conditions. Elliott photo. 2—Belladonna lilies are among the most popular autumn-flowering bulbs. Green and Hahn photo. 3—*Lilium auratum virginale*, one of the large-flowered type, is one of the most superb of the lilies. Elliott photo. 4—A stem rooting plant, *Lilium henryi*. Photo News photo. 5—*Lilium tigrinum* is easily grown. Elliott photo.

5

4

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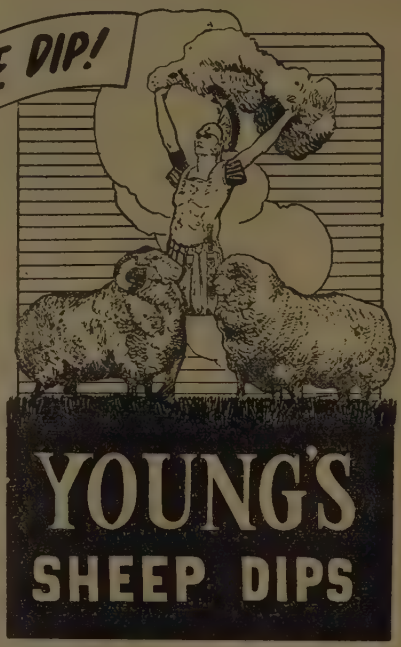


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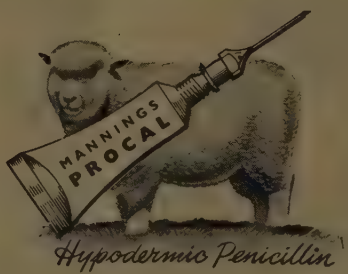


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Lilies have been found growing naturally in many parts of the temperate zone of the northern hemisphere and because of this wide natural habitat the various species thrive in greatly differing conditions of soil, climate, and environment. Some are delicate, requiring special attention; others are robust and can tolerate vigorous conditions.

Lilies require well-drained conditions at all times and most grow best in light sandy loam to which has been added peat, leafmould, or other organic material. However, some species, such as *L. candidum*, *L. tigrinum*, *L. elegans*, *L. hansoni*, *L. croceum*, and *L. monadelphum*, will grow in heavier soil, provided it is well drained.

A slightly sloping position with a gravelly subsoil is ideal. This type of subsoil can be built up artificially. The soil is removed to a depth of 18in., the bottom filled with stones and gravel to a depth of 4in., a mixture of soil and gravel is put in for a further 6in., and placed in finally is the soil in which the lilies are to grow.

Lilies are gross feeders, and as they generally remain in the same position for a number of years, the soil should be fairly rich. It requires a liberal addition of well-rotted animal manure or compost, but no fresh manure should be brought into contact with the roots, as that may damage them.

If no other plants are growing among the lilies, a light mulch will be beneficial during summer. The bulbs will benefit by the cooler soil and it will help to conserve moisture, which is necessary for good growth of most species in cultivation. Some lilies produce roots from the stems, as well as from the bases of the bulbs; these stem roots are close to the surface and are liable to be affected by hot and dry conditions, if not protected by a mulch.

Though some lilies will grow in full sunshine, most of them prefer some shade. Planting in the partial shade of trees is excellent, provided the roots of the trees do not starve the lilies. Such a situation gives a good air circulation round the plants and adequate light; furthermore, the flowers will last much longer.

Though most lilies are self-supporting, it may be necessary to stake them where they are growing in exposed areas.

Time of planting is important, as unlike most bulbs lilies are never completely dormant. The greatest dormancy occurs after flowering, and transplanting is therefore best done as soon as the flower stalks have died. Care should be taken not to damage the fleshy roots, nor should they be allowed to dry out. If the bulbs cannot be replanted immediately, they should be covered with a moist sack or packed in damp moss.

The bed in which they are to be planted should if possible have been prepared some time before to allow for natural settling of the soil, and it should be suitably moist.

The depth for planting the bulbs has caused much controversy, but a good general rule is to cover each bulb by 3 times its diameter. This rule may have to be varied slightly according to soil type or perhaps

**Gladioli make an excellent flower for the garden and for cutting. Staking is required where the position is exposed.**

**Dahlias are easily grown and give a bright display from midsummer until the first severe frost.**

because of a high water-table. In a heavy soil planting can be a little shallower and in a light soil slightly deeper. Coarse sand placed immediately under the bulbs is beneficial in draining off excess water. Species such as *L. candidum* and *chalcedonicum* do not produce stem roots and should be planted nearer the surface.

Distance apart will vary according to size of bulb and type of flower and may be from 4 to 18in.

Lilies, like most other plants, look better if planted in groups or drifts and this should be considered when planning the layout.

Lilies can be propagated vegetatively by separating the offsets from the main bulb, by the bulbils growing around the base of the stem or in the axils of the leaves, and by scales. The first method is the easiest, and is best carried out after the stems dry off after flowering. The offsets and bulbils can be lined out where they will not be disturbed until they are of flowering size. Scales from the bulbs can be planted in a box or cold frame a few inches apart. After small bulbs have appeared these can be lined out as recommended for bulbils.

Propagation can also be carried out by seeds, when available. These should be sown as soon as they are ripe in a friable, rich compost. Such a potting compost can be made up from 1 part of sand, 1 part of sterilised loam, and 1 part of peat or leafmould to which is added 1½oz. of blood and bone, 1½ parts of superphosphate, and ¾ part of sulphate of potash per bushel of the mixture. Watering may have to be carried out daily and shading with scrim is beneficial.

Some species will put up leaves a few weeks after sowing and will generally flower in 2 to 4 years. Others may only form a small bulb the first season without forming top growth until the following year. These may take 3 to 5 years to flower. The seed box should therefore be retained for one year before it is discarded, even if no top growth occurs.

Seedlings should not be moved from the seed-bed before they show 3 or 4 leaves; they can then be lined out until ready for their final position.

## Diseases

Of the various diseases affecting lilies botrytis rot is the most common. It first shows as brown spots on the leaves, and, if a warm and humid period prevails, it will spread quickly and infect all foliage, and even stem and flowers in a severe attack. When the first spots appear the infected leaves should be removed and burnt and the plants sprayed with Bordeaux mixture or copper oxychloride. It is advisable to apply routine sprays throughout spring and early summer, as prevention is easier than cure.

Virus diseases are common in lilies and several are recorded in this country. The symptoms generally are mottling or distortion of the foliage, and when an infection is severe or if two different viruses are present in the same plant, distortion of the flowers may occur.

There is no known cure for virus, and vegetative propagation will carry it over to the new plants. It is considered that virus is not carried over in seed, and propagation by seed can be recommended; all infected bulbs should be destroyed.

Aphides and thrips are the main carriers of virus and should be kept from lilies by spraying as soon as any appear. Insecticides such as H.E.T.P., T.E.P.P., or nicotine sulphate should be used.

## Easy Varieties to Grow

Though lilies are not difficult to grow, it will be advisable for the beginner to start off with some of the varieties that do not demand any special growing conditions, but will easily provide a pleasing display. Among those varieties are:—

*L. candidum* (white).

*L. formosanum* (white).

*L. hansoni* (golden yellow, spotted purplish brown).

*L. henryi* (orange, spotted reddish brown).

*L. longiflorum* (white).

*L. martagon* (claret purple, spotted purplish black).

*L. regale* (white, striped purple outside).

*L. speciosum* (various colours in the varieties).

*L. tigrinum* (salmon red, spotted purplish black).

*L. auratum* and its many varieties are among the most beautiful lilies grown, and even if not among the easiest to grow, they are not difficult. With a little extra care, according to the general directions given earlier in this article under "situation and cultivation", most home gardeners should be able to get them to flower satisfactorily.

## Gladiolus

The most popular corms are gladioli. They provide a good display in the garden during summer and autumn and are excellent as cut flowers.

Good soil conditions are required, and because of the height to which they grow the situation should not be too exposed.

To obtain the best results the site should be prepared in autumn by digging in well-rotted animal manure or compost at a small bucketful (2 gallons) to the square yard. Before planting is done, a dressing of blood and bone at 2oz. to the square yard should also be applied.

Time of planting varies according to locality, but is mostly from August to October. Flowering will take place 85 to 120 days from planting, depending on variety and time of year. The corms should be placed 3in. to 4in. deep and 6in. to 12in. apart, according to the plants intended to grow among them.

When the flower stalks begin to grow they should be tied to stakes placed 2in. away from each plant; as the stalks lengthen several ties should be made with raffia or some other soft material.

If soil conditions become dry, especially on sandy soils, watering must be carried out.

When flowers are being cut as many leaves as possible should be left on the plant to assist the build-up of the corm for next year.

Gladiolus is the exception to the rule that bulbs and corms should not be lifted before the foliage has died down. They can be dug 6 weeks after flowering; if they are left longer, they are liable to be attacked by insect pests and diseases, and the cormlets formed around the bases of the corms will be dislodged and cannot be lifted completely. This is a loss if the cormlets are wanted for growing on, and in any case they are a nuisance when they grow the next year.

After they are lifted the stems can be cut off to within 2in. of the corms, which should then be spread out in a sheltered, airy position. When they have been drying a few days the old corms should be removed cleanly from the bases of the new ones, and when the stems are completely dry they may be pulled off.

If additional stock is required, the cormlets from healthy plants can be collected and should be planted early the next spring. When cormlets are given a long growing season a few may flower that same year, and from the remainder good flowering corms should develop for the following year's planting.

The major pest of gladiolus is thrips. These small insects are not easily seen, but the silvery look on leaves and spotted and sometimes deformed flowers are the result of their activity. They may also transmit virus diseases. Control can be obtained by spraying with H.E.T.P., T.E.P.P., or D.D.T. emulsion.

Of the diseases botrytis rot is the most common. This attacks and rots the corms during storage. It is controlled largely by the early lifting and thorough drying of corms. If the disease is suspected, the corms should be dipped in a mercury based fungicidal solution before they are stored.

The corms should be dipped in such a solution before planting to prevent introduction of fungous diseases into the soil. Gladioli should not be planted in the same position year after year.

## Dahlia

Of the tuberous-rooted plants dahlias are the ones most used in the flower garden. They are easily grown and give a bright display over a long period. Though not long lived as cut flowers, they are popular for home decoration.

Dahlias are sun lovers and will grow in most soils, provided drainage has been attended to. For them to do really well the bed in which they are to be planted should be prepared with adequate animal manure or compost, which should be added preferably during the previous autumn or early winter. Before they are planted a dressing of superphosphate, sulphate of ammonia, and sulphate of potash should be applied at 2oz., 1½oz., and 1oz. per square yard.

Distance apart will vary according to type of plant and vigour of the variety; the distance is generally 1½ft. to 2½ft. The area should be marked out before planting and stakes should be driven in for plants requiring them. This should always be done before planting, as it is not possible later on to drive a stake near the centre of the plant without damaging the tubers.

Planting can be done as soon as danger of frost is over, but if dahlias

are planted too early in northern districts, few flowers will remain into autumn.

Much better plants will develop if only small tubers with 2 or 3 buds are planted. If large clumps are planted, there will be too much competition for food supply to all the shoots that will develop, and weak plants will result.

Dahlias grow very quickly and if conditions are dry, watering must be carried out. A mulch of organic material will assist in keeping the soil both moist and cool; grass cuttings are excellent for this, provided each application is put on thinly. Such a mulch will also keep the weeds down. Tying up must be done as soon as required during the early part of the season, especially if the position is exposed.

In frosty areas dahlias will be cut down by the first frost, and in warmer districts the plants are often exhausted and ready to be cut down in late autumn.

Tubers must be stored in a dry frost-free position during winter. In northern districts they can be left in the ground if the space is not required before spring.

Division of the old tubers is the usual means of propagation in the home garden, but if more of a variety is required, additional plants can be grown from cuttings taken as soon as the shoots break away. This can be accelerated by placing the tubers in a propagating frame or other warm position. Plants from cuttings will flower the first season.

Seed germinates readily and "bedding dahlias" are raised as seedlings; they will flower the first year. If seed is collected from named varieties, not one of the seedlings may be like the parents, but often, nevertheless, some very good plants result.

Virus is the most widespread disease affecting dahlias; there are several types and the symptoms are either stunting of the growth or mosaic pattern on the leaves. Plants that are suspected to have virus should be dug and burnt, as there is no known cure for this disease; such plants if left may infect dahlias and many other plants in the area.

Aphides and thrips are the worst insect pests of dahlias and are the chief carriers of virus. A sharp lookout should be kept for them. H.E.T.P., T.E.P.P., or nicotine sulphate will control both.

## Agapanthus

Though not suitable for cold climates, agapanthus, a tuberous-rooted plant is of great value in warmer districts, especially on hill sections where it can be used for holding banks and where it forms a good edge to a path It is evergreen and carries umbels of white or blue flowers on 3ft. stems during late summer and early autumn.

It can be propagated by cutting up the roots, leaving a few buds on each piece, and planting them 3in. or 4in. deep during winter and spring. Once established these plants will tolerate very dry conditions, but to get the best flowering watering must be done before and during the flowering season.

## Alstremeria

Alstremeria, perhaps better known as the Peruvian lily, is a tuberous-rooted subject which seems to do better in semi-shade than in full sun. It flowers on 2ft. to 2½ft. stems during summer and is available in different colours. Though not tolerant to heavy frosts, it will stand adverse growing conditions.

It prefers a light soil, which must be deeply cultivated, as the tubers should be planted about 12in. deep. A soil rich in humus will give the best results. Planting is usually done in spring and the plants can be lifted for storing in late autumn when the tops have died down. They can also be left in the ground for a number of years, but should be lifted and replanted when they show signs of being crowded.

## *Amaryllis belladonna*

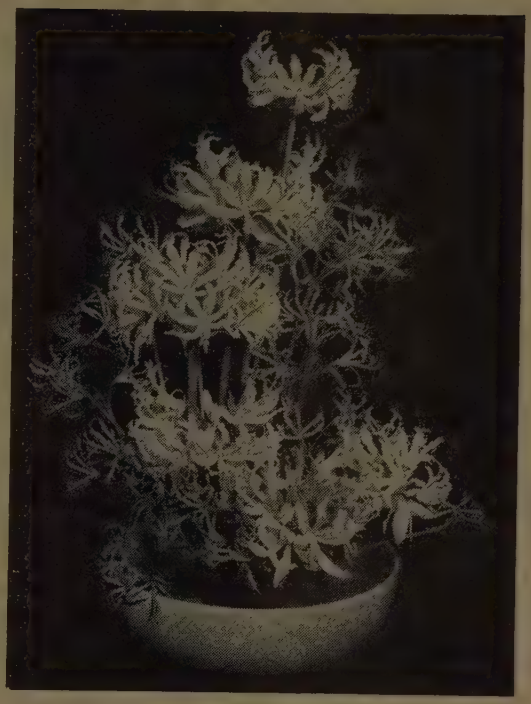
Belladonna lilies are well known in the warmer districts. Flowers are produced in late summer or early autumn, before foliage appears, hence the name naked lady. The stems are 2ft. to 3ft. high, and the individual flowers, about 3in. long in white, red, and pink shades, are delicately scented.

The bulbs should be planted in well-drained soil during late spring when they are dormant; they should be only half-covered with soil and should not be lifted before they are crowded out by offsets. When the flowers start showing the bulbs should be given plenty of water, but otherwise they are suited by dry conditions. Though they will grow in semi-shade, a sunny position suits them best.

This plant can be recommended only for favourable positions in the colder districts.

## Canna

Contrary to the general belief, cannas require a deep and rich soil and a plentiful supply of moisture. If they are given such growing conditions in a sunny position, they will flower for a long period during summer and well into autumn. They are obtainable in many colours and most of the newer varieties grow to 4ft. to 6ft. high. On account of their bright flowers and big foliage in varying shades of green and bronze they are often used for planting in association with other plants.



**Cut flowers of nerines.**

Old plants can be broken up in spring, preferably with several buds to each tuber, and planted 2in. below the surface.

If they are planted in a group, 1½ft. to 2ft. should be allowed between plants.

In frosty areas they should be covered with a protective mulch during winter.

## Nerine

The large flowered varieties and hybrids of the nerine (Guernsey lily) will tolerate very dry and crowded conditions. The flowers, on stems up to 2ft. long, are rather short lived, but very showy in autumn; foliage appears after flowering.

A well-drained situation is essential and they prefer full sun. The bulbs should be planted in summer with the neck at ground level and they should not be disturbed for several years. They are frost tender and in southern districts must be given a protected position.

## Sprekelia

Jacobean lily (*Sprekelia formosissima*) is a good early summer flower for warmer districts. The large crimson, orchid-like flowers are carried on 1ft. stems. The plant should be given a warm position in a rich, well-drained soil. Propagation is by offsets from old bulbs. These should be planted just below the surface in early spring and can be lifted in autumn if there is danger of frost damage; otherwise they can be left in for several years.

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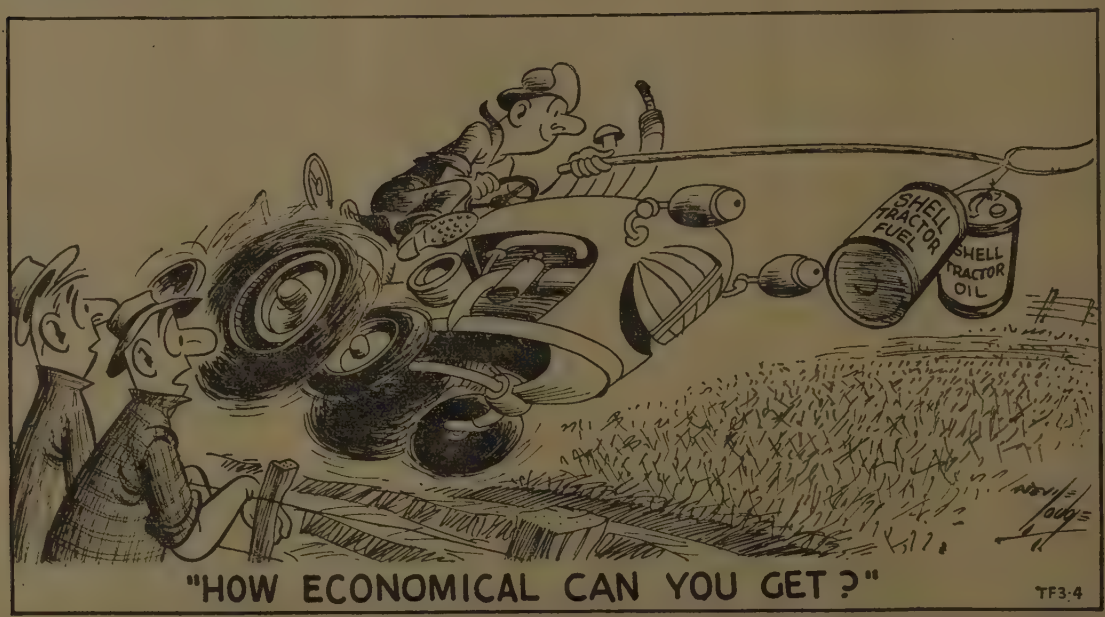


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## Tigridia

Trigridia are very colourful and quaint looking. They have some similarity to iris and belong to that family. The three outer petals form a triangle of clear colour and the centre of the flower is spotted. Flowering takes place in late summer on stems up to 3ft. high.

Bulbs should be planted 4in. deep during late spring in a rich soil in full sun; the best effect is obtained when they are planted in groups 6in. to 9in. apart. Staking is seldom necessary. Individual flowers are short lived, but the many buds open in quick succession. They are best lifted and carefully dried each autumn and should be stored in a cool, but frost-free place.

## Tritonia

Generally known as montbretia, tritonia are grown in many gardens and give a fine display in late summer and early autumn. They grow to 3ft. high and the flower spike resembles that of a gladiolus, though branching and with much smaller flowers. Some rich-coloured hybrids are available in yellow, orange, and red. The older orange types spread very rapidly.

To flower well they must be grown in full sun, and a light, well-drained soil suits them. The corms are generally planted out in spring 3in. deep and 6in. to 9in. apart. They can be lifted each year after flowering or left in for 2 or 3 years.

## Tuberous Begonias

The large-flowered type can be planted outdoors in a sheltered place that receives partial shade; the multiflora hybrids, which are smaller flowered and more compact in habit, will tolerate almost full sun and do not demand as much shelter against wind.

The tubers should be placed in boxes in a light compost well supplied with leafmould during later winter, and kept under glass until they can be planted out in their flowering position in early summer.

A well-drained soil rich in organic material is required, and to it should be added 2oz. of bone flour to the square yard. The tall growing varieties must be carefully staked so that the tubers will not be damaged. During hot weather, adequate water must be given.

They will flower until cut down by frost, when they should be carefully lifted and dried slowly before they are stored for next season.

# Garden Work for October

Seed sown in boxes last month will be ready for pricking out. Where the percentage of germination was high and the box is crowded, pricking out is especially important to allow each seedling sufficient space to develop into a robust plant suitable for bedding.

Before seedlings are pricked out or transplanted the soil in the box should be well watered so that the roots do not come away bare of soil. Seedlings should be handled by the leaves and not by the stems. The warmth and pressure of the fingers on the stems at this stage of growth are liable to damage that vital growing area. If damage occurs to the leaves, fresh ones quickly develop.

[*Elliott*

**Tuberous begonias can be grown outside in a sheltered, partly shaded position preferably getting the morning sun.**

Once the seedlings are pricked out they should be watered with a fine spray and kept shaded during the heat of the day for several days until they are well established. Continued attention should be paid to watering. If the boxes are allowed to dry out for too long, the plants may become hardened and stunted; if kept too wet, they are liable to attack by damping-off fungi.

Seedlings when transplanted in the garden require similar watering and should be set out during a cool part of the day, preferably a cloudy day.

Sowing of annuals may be continued, later sowings prolonging the period of blooming, but outdoor sowing should be delayed unless the soil is freely drained and the situation warm and sheltered. Seeds which give better results sown where the plants are to remain are cosmos, clarkia, godetia, larkspur, schizanthus, and portulaca. The area to be sown should be well prepared and the soil worked to a fine tilth, firmed, and levelled. Seed should be broadcast sparingly; otherwise severe thinning out is necessary to allow each plant sufficient room to develop. Thickly sown seed gives a forest of seedlings which, if not thinned, struggle for light and air and compete for moisture and food. The final display of crowded plants on lanky stems cannot equal the display of plants which have had sufficient room to develop a balanced, bushy habit carrying a larger number of flower heads.

Plantings of more tender annuals should not be made until danger of frost is over. Bonfire salvias and zinnias do better when planted out in warmer weather.

If seedlings are bought, sturdy compact plants with foliage of a healthy colour should be selected. Lanky seedlings seldom branch freely and do not create the best display.

## Gladioli

All corms which are shooting in storage should be planted without delay. Later plantings may still be made, but once the corms shoot they cannot be held out of the ground any longer. Dusting with D.D.T. is advisable to kill any thrips which may have overwintered on the corms. These later plantings are usually attacked by thrips and should be sprayed with a D.D.T. emulsion at ½ fl. oz. to 4 gallons of water as soon as the insects are observed. The first spray should be followed by a second in 8 to 10 days to kill the next brood of insects. Thrips are small sucking insects which may be observed as groups of dark specks on the leaves from October onward. They cause a typical silvering of the foliage. With heavy infestations the insects congregate on the bud and at the base of the flower petals, causing the petals to take on a whitish, stunted appearance, and in extreme cases they prevent the flowers from opening.

During a hot, dry season thrips may be found on a wide range of garden plants, and a heavy infestation is sufficient to cause partial defoliation of such shrubs as luculia, fuchsia, and rhododendron.

## Chrysanthemums

Chrysanthemum cuttings may still be taken. Shoots of 3in. to 4in. are trimmed just below a leaf, the lower leaves removed, and the cutting inserted in sand in a box in a cool frame or glasshouse. Chrysanthemum cuttings can also be rooted in the open

Rhododendron showing typical silvering of foliage due to a heavy thrips infestation.

border, but they should not be planted in the border until danger of frosts is over. Cuttings rooted earlier may be planted out.

## Dahlias

All stored dahlia tubers should be planted now. Young growth on established plants should be inspected for virus. Unfortunately a great many dahlias in this country are affected with spotted wilt virus, which causes concentric yellow rings on the foliage and often makes the plants unthrifty. As so many other kinds of plants, including tomatoes, poppies, asters, and some weeds, are affected by this virus, it is almost impossible to prevent infection of dahlia plants. Fortunately some varieties show little or no sign of infection and others are not very seriously affected, especially if they are grown under good conditions of situation, soil, and watering. Certain less sturdy varieties which appear to be unable to withstand the effects of virus infection become definitely stunted and are unable to produce good blooms. Severely affected plants should be lifted and burnt immediately, but slightly affected ones may be given a little more time to enable them to show whether or not they will develop satisfactorily.

## Feeding the Garden

The fertility of soil in the flower garden needs to be maintained just as in any other part of the garden, though not generally at the same high level as for green vegetables. To ensure a worthwhile flower display an annual spring dressing of a fertiliser mixture containing 2 parts of superphosphate, 3 parts of blood and bone, and 1 part of sulphate (or muriate) of potash will be suitable for most garden soils. The mixture should be used at 2oz. to 4oz. per square yard.

The mixture may be worked into the soil before annuals are planted and may be broadcast and worked in around trees, shrubs, and perennials. Broadcasting to cover the full root range of larger plants and trees is recommended in preference to applying the fertiliser close to stems or trunks. Fertilisers should not be placed in direct contact with bark or foliage because it may cause scorching of tissues of some plants.

**A dressing of lime may also be given to the garden this month, but any borders containing acid loving plants such as rhododendrons, azaleas, kalmias, camellias, daphnes, pieris, and ericas should not be limed.**

Borders containing bearded iris, carnations, sweet peas, gypsophila, and scabious can be given a lime dressing of 4oz. per square yard. Areas newly dug out of turf may also be given a dressing at this rate. Lime has three actions in the soil.

1. It provides calcium for use as a plant food.

2. It reduces the degree of soil acidity.

3. It has a physical action by improving the crumb structure of the soil.

The larger particles so formed allow freer movement of soil moisture, which in turn gives better soil aeration and drainage. It is this last action which is particularly beneficial on heavy clay soils.

**Mulching** can be carried out now, while the ground is moist, to conserve moisture and keep the roots cool during summer. Shrubs which benefit especially from this are rhododendrons, azaleas, daphnes, kalmias, ericas, and roses. Perennials and annuals also benefit. Mulches of well-rotted farmyard manure, decayed compost, lawn clippings, or sawdust are all satisfactory, but sawdust should not be placed on dry soil. The mulch should extend to the spread of the branches so that it shades, cools, and protects the feeding roots. A mulch now may not be sufficient, and as the season advances further organic matter can be added, but it should not be built up around the trunks of plants, because the moisture and warmth from the process of decomposition provide conditions suitable for the establishment of fungi and insects which may cause damage.

## Shrubs and Trees

October is the very latest that planting of sub-tropical or evergreen shrubs can be carried out with any degree of safety, and in districts experiencing summer drought shrubs may require regular watering to see them through summer. Rhododendrons failing to flower may be supporting one extra vigorous shoot which is draining off too great a proportion of food. This robber growth should be cut out or cut back. Rhododendrons will not thrive if planted in a draught, in waterlogged soil, or in a position where their roots dry out. Spent flowers should be cut off once they have faded, and certainly should not be left on long enough to set seed.

## Weeds

Weeds grow apace during October. While they are growing vigorously but before the majority of them set seed is the time to get them out. At this stage of their growth they are most susceptible to weedkillers.

Because of the danger of damage to ornamental plants from spray drift the use of hormone weedkillers in gardens cannot be generally recommended, though they can be used for broad-leaved weeds in lawns. To minimise the likelihood of drift while spraying, the work should be carried out on a calm day with a coarse nozzle held low to the ground. A non-volatile material should be used. Before a lawn is treated with weedkiller it should be left uncut for at least a week to ensure a larger area of leaf on the flat weeds to receive the spray, and cutting should be left until a week after the treatment. Some non-volatile weedkillers can be watered on to the lawn with a watering can. -- This method is safer than spraying, as little or no spray drift is produced.

Gaps left where weeds have been removed can be raked over or filled with soil and sown with grass seed. Equipment used for hormone weedkillers should be kept for that purpose alone, and not used for spraying grapes, tomatoes, or roses, which are particularly susceptible to hormone damage.

## Lawns

Sowing down of new lawns can be carried out now with a mixture of 2 parts of chewings fescue to 1 part of browntop, but because of drying out in summer this is not the best time to put down a lawn. Better results may be gained by sowing in autumn.

## Planting and Sowing

Violets can be divided and replanted now. A bed of violets tends to run out and needs to be replaced with young, healthy runners. Violets prefer a cool, shady situation, though they do well in an open, sunny site as long as they do not dry out too much in summer.

Polyanthus seed may be sown from October to May and with all the new, large-flowered forms available it is worth while to try some of them. Seed should be sown in a well-prepared bed along a shady border. Once the third leaf forms on the seedlings they should be lifted and planted out at 4in. spacings in another portion of the shady border. In autumn they can be lifted again to their permanent flower beds. Polyanthus are cool climate plants, and to do their best in hot districts they should be lifted each year after flowering and put in the coolest bed available.

# Recipes with

# Rhubarb

RHUBARB is one of the oldest of cultivated plants, being known in China, its country of origin, in 3000 B.C. The plant was introduced into England in the 17th century and used for the medicinal value of the roots. Later the stems were used as a food. The leaves contain oxalic acid and should not be used as a substitute for greens, as they have been known to cause serious illness. In the home garden the harvesting of rhubarb is usually done by the housewife, and where the two varieties—the spring and summer variety and the winter variety—are grown there is a continual supply which can be used to make a great variety of delicious dishes, recipes for many of which are given here by Molly Macpherson, formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland.

WHEN rhubarb reaches full size it should be pulled while still tender. The stalk should be grasped close to the ground and pulled to one side so that the crowns will not be damaged.

## Cooking with Rhubarb

Rhubarb has a better appearance and flavour if cooked as soon as possible after being pulled. The stalks need to be trimmed at both ends and any fibrous skin should be removed at this stage. The stalks can be washed or wiped, then cut into short lengths for cooking.

### Stewed Rhubarb

Prepare the rhubarb for cooking and barely cover with water. Bring to the boil and cook until tender. Overcooking will destroy the shape of the rhubarb pieces. Add sufficient sugar to sweeten just before removing the rhubarb from the heat. The rhubarb pieces keep their shape well if the pieces are placed in a pie dish or casserole with water and sugar and cooked in the oven heat that remains after baking has been done.

The addition of dried fruit such as raisins, soft prunes, or lemon peel makes pleasant variations in the flavour of stewed rhubarb. (Marmalade that has not set is a good substitute for lemon peel in stewed rhubarb.)

### Sausage and Rhubarb Fritters

**Batter**

4oz. of flour
Pinch of salt
1 egg
Milk

Beat the egg and add the sifted flour and milk alternately until all the flour is blended and the batter is the consistency of thick cream. Add the salt and beat for 5 minutes. Allow the batter to stand ½ hour before using.

Allow 1 sausage for every 2 fritters. Prepare thin rhubarb stalks and cut into 2in. lengths. Half stew them, but do not allow to break. Drain and cool. Skin the sausages and allow half a sausage to each length of rhubarb. Roll the sausage meat around the rhubarb, keeping each roll long and narrow. Dip the rolls into the batter and cook them in fat which is just beginning to smoke until they are a golden brown. Serve hot.

## Cakes

### Rhubarb Crumb Tartlets

**Pastry**

4oz. of butter
1 egg yolk or 1 egg
1 teaspoon (bare) of baking powder
3oz. of sugar
7oz. of flour
Pinch of salt
Jam

Sift the dry ingredients together and rub in the butter. Mix in the egg to bind and a little milk if the mixture is too dry. Roll the pastry out on a floured board and cut circles to line patty tins for tartlet shells. Put a little jam in each tartlet and bake in a moderately hot oven. (375 degrees F.). Allow to cool.

**Filling**

1 cup of stewed, sweetened rhubarb (drained)
1 cup of stale cake crumbs or crushed biscuits
1 dessertspoon of sherry
¼ cup of rhubarb syrup
Juice and grated rind of 1 lemon
1 egg white
2 tablespoons of sugar
Crystallised cherries or browned coconut

Combine the rhubarb, stale cake, sherry, rhubarb juice, and lemon (a little red food colouring may be added). Fill the mixture into the cooled pastry cases. Beat the egg white stiffly and gradually add the sugar; beat to a meringue consistency. Spoon on to the tartlets. Bake in a moderate oven (350 degrees F.) until the meringue is set and lightly browned. Decorate with crystallised cherries or browned coconut.

### Rhubarb Rolls

Small quantity of rhubarb prepared and cut into 2in. lengths
½ cup of sugar blended with 1 teaspoon of cinnamon
1 lightly beaten egg

**Short Pastry**

8oz. of flour
1 teaspoon of baking powder
½ teaspoon of salt
1 tablespoon of sugar
3oz. of butter
Milk to mix

Prepare the short pastry by sifting together the dry ingredients. Rub the butter into the dry ingredients until the mixture is crumbly. Mix with

sufficient milk to bind the ingredients to a paste. Roll out the paste to ¼in. thickness and cut into 3in. by 2in. strips. Wet the edges of the strips with cold water. Place one piece of rhubarb on each strip, sprinkle with sugar and cinnamon, and roll up. Brush the tops of the rolls with the lightly beaten egg and dust lightly with the sugar and cinnamon. Bake for 20 minutes in a hot oven (400 degrees F.).

## Cold Desserts

### Rhubarb Trifle

1lb. of stewed rhubarb
Stale sponge
1 pint of custard

Cut the sponge into slices and place in a dish. Pour the stewed rhubarb over the sponge. Pour the custard on top. Allow to cool and decorate with whipped cream. A delicious flavour is obtained if chocolate sponge is used.

### Jellied Fingers

Stale sponge
Stewed rhubarb (2in. lengths)
1 packet of red jelly crystals

Cut the stale sponge into pieces 2in. long and place in a shallow dish. Place lengths of rhubarb on the pieces of sponge (see illustration on page 307). Mix the jelly crystals according to directions and pour the jelly over the sponge pieces so that they are thoroughly soaked. Allow to set. Decorate with whipped cream, if liked, before serving.

### Rhubarb Marshmallow

2 cups of sweetened and drained rhubarb
2 cups of rhubarb juice
3 level dessertspoons of gelatine
3 tablespoons of hot water
Grated rind and juice of 1 orange or lemon
Few drops of red food colouring

Soften the gelatine in the hot water. Add the hot rhubarb juice and the food colouring and stir until the gelatine is dissolved. Allow to become cold but not set. Whip until thick and creamy. Fold in the remainder of the ingredients. Pour into a wetted mould and chill until set. Unmould and serve garnished with whipped cream, rhubarb syrup, custard, or ice cream.

### Rhubarb Fool

1lb. of rhubarb
2 tablespoons of sugar
1 to 2 tablespoons of water
½ pint of cold custard

Stew the rhubarb until tender with the sugar and the water. Allow to cool. Strain off most of the juice. Add the custard to the fruit and beat the mixture well. Decorate with coloured coconut or other suitable garnish and serve cold. Use the juice to make a sauce or a fruit drink.

### Rhubarb and Custard Flan

1½oz. of butter
3oz. of flour
3oz. of oatmeal
Pinch of salt
Water to mix

Filling

½lb. of stewed rhubarb
½ pint of thick custard

Rub the butter into the flour. Add the oatmeal and the salt and mix to a stiff paste with the water. Line a 7in. sandwich tin with the pastry, prick the bottom well, and bake in a hot oven (425 degrees F.) for 20 minutes. Drain the juice from the stewed rhubarb and arrange in the flan case. Pour the custard over and leave to set.

### Rhubarb Delight

Short pastry
Rhubarb stewed with 1 dessertspoon of marmalade
1 heaped tablespoon of golden syrup
2 tablespoons of breadcrumbs

Line a pie plate with pastry. Put the golden syrup in a cup and stand in hot water to melt until thin and runny. Drain the juice from the rhubarb and place the rhubarb in the pastry. Pour the golden syrup over and sprinkle with breadcrumbs. Cover with a very thin layer of pastry and flute the edges. Bake in a hot oven (450 degrees F.) for 20 minutes; when cold dust the top with icing sugar.

## Hot Desserts

### Rhubarb Crumble

1lb. of stewed rhubarb
1½oz. of butter
4oz. of flour
Pinch of salt
3 tablespoons of sugar

Drain some of the juice off the stewed rhubarb and place the rhubarb in a pie dish. Rub the butter into the flour, salt, and sugar until the mixture is crumbly. Spread the crumbly mixture over the fruit. Bake in a moderate oven (375 degrees F.) for 15 to 20 minutes.

### Baked Rhubarb Pie

1lb. of rhubarb
½ cup of sugar
1 pint of bread cubes
3 tablespoons of milk
2 tablespoons of sugar

Stew the rhubarb with sufficient water and sweeten with the ½ cup of sugar. Put the stewed fruit in a pie dish and cover with the cubes of bread. Pour the milk over the bread and sprinkle with the 2 tablespoons of sugar. Bake in a hot oven (400 degrees F.) for 20 to 30 minutes.

### American Rhubarb Pie

Short pastry
3 cups of stewed and drained rhubarb
1 cup of rhubarb juice or water
1 cup of sugar
1 tablespoon of flour
1 egg
Grated rind and juice of 1 lemon or ½ teaspoon of lemon essence

Line a pie dish with the short pastry and put the rhubarb in the middle. Sift the flour and sugar. Mix in the egg and juice or water to make a smooth paste. Heat until thickened, stirring all the time. Add more juice or water if necessary. Flavour with the lemon rind and lemon juice. Allow to cool a little, then pour over the rhubarb. Cover with a criss-cross of pastry for a lattice top and glaze with milk. Bake in a hot oven (450 degrees F.) for 20 minutes. This dish may be served hot or cold.

### Rhubarb Puffs

3oz of sugar
¾ cup of water
2½oz. of butter
1 beaten egg
½lb. of flour
½ teaspoon of salt
2 large cups of diced rhubarb
1 heaped teaspoon of baking powder

Cream the butter and sugar together, then add the beaten egg and water. Beat all together. Sift in the dry ingredients and beat again. Stir in the diced rhubarb. Pour into a greased pie dish. Bake in a moderate oven (350 degrees F.) for 40 minutes. Serve with boiled custard.

### Rhubarb Bread Pudding

2 cups of diced rhubarb
2 cups of bread-crumbs
1 tablespoon of lemon juice
1 beaten egg
½lb. of sugar
Grated rind of 1 lemon
1 cup of milk
1 dessertspoon of butter

Place the rhubarb in a basin with the sugar, breadcrumbs, and lemon rind and juice, and mix. Beat the milk into the egg and stir into the rhubarb mixture. Place in a greased pie dish. Dot with the dessertspoon of butter and bake in a moderately hot oven (375 degrees F.) for 1 hour. When baked this dish may be spread thinly with rhubarb jam and covered with a meringue as described here.

### Meringue Topping

2 egg whites
¼ teaspoon of vanilla
2 tablespoons of sugar

Beat the egg whites until stiff, then beat in the sugar. Spread the meringue on top of the pudding and return it to the oven until lightly browned.

### Rhubarb and Apple Pudding

1 large apple
4oz. of breadcrumbs
4oz. of brown sugar
Pinch of nutmeg
⅓ cup of milk
3 or 4 sticks of rhubarb
4oz. of shredded suet
Pinch of salt
2 beaten eggs

Peel and chop the apple coarsely. Chop the rhubarb into small pieces. Mix the fruit with the dry ingredients. Add the eggs and stir in the milk. Allow the mixture to stand for 1 hour, after which it should drop readily from a spoon. Add a little milk if it is too stiff. Three-quarter fill a greased basin. Cover with greaseproof paper and a cloth. Steam for 2 hours. Turn out and serve with a rhubarb sauce made by thickening 2 cups of sweetened rhubarb juice with 1 dessertspoon of cornflour.

### Rhubarb and Apple Layer Pudding

6oz. of flour
Pinch of salt
3 tablespoons of milk
1½ cups of diced raw apple
Grated rind of 1 lemon
½ teaspoon of baking powder
2oz. of butter
1½ cups of diced raw rhubarb
1 cup of sugar

Sift the flour, baking powder, and salt, and rub in the butter. Mix to a dry dough with the milk. Take a quarter of the dough, roll it out, and line a greased basin with it. Divide the remainder of the dough into six parts. Roll each into a circle the size of the basin. Fill the lined basin with alternating layers of rhubarb, pastry, and apple, sprinkling each layer of fruit with lemon rind and sugar, finishing with a layer of pastry. Moisten the edges of the lining and press on to the top layer. Cover the basin with greaseproof paper and steam for 2 hours.

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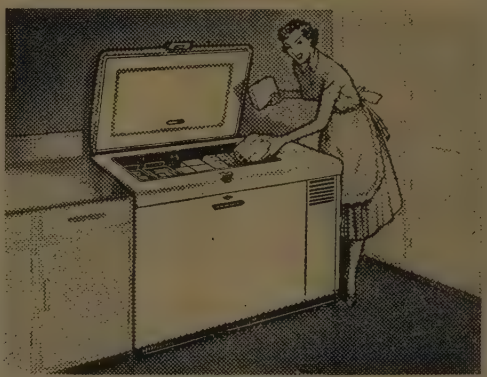

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However, if bottling is desired, the sticks keep their shape better if they are placed in the bottle raw before being processed. The method of processing is described in the "Journal" for June 1954.

### Rhubarb and Orange Conserve

9lb. of rhubarb
1 cup of water
10 oranges
10lb. of sugar

Cut up the rhubarb finely and boil with the water to a pulp. Press through a fine sieve and set aside. Slice the oranges finely. Add the sugar to the oranges and stir over heat until the mixture boils. Boil until tender (20 minutes), stirring to prevent burning. Add the rhubarb, bring all to the boil, and boil for ½ hour. Bottle while hot and seal.

### Rhubarb and Dried Fig Jam

6lb. of rhubarb
1½lb. of dried figs
¾lb. of lemon peel
6lb. of sugar

Cut the rhubarb, figs, and peel into small pieces and sprinkle with half the sugar. Stand overnight. Next day add the remainder of the sugar and boil for 1½ hours or until the jam will set.

### Rhubarb and Banana Jam

2lb. of rhubarb
6 large bananas
Juice of 1 lemon, if liked
Sugar to equal weight of rhubarb and bananas

Cut up the rhubarb and slice the bananas. Add the sugar and boil all ingredients together for ½ hour or until the jam will set.

### Rhubarb and Strawberry Jam

1lb. of rhubarb
2½lb. of sugar
2lb. of strawberries

Cut up the rhubarb and hull the strawberries. Cover all with half the sugar. Stand overnight. Next day bring to the boil, add the remainder of the sugar, and boil for 30 minutes or until the jam will set.

### Rhubarb and Carrot Jam

2 cups of minced carrots
2 cups of sugar
2 cups of diced rhubarb
4 oranges cut finely

Boil all the ingredients together for 1½ hours or until the jam will set.

### Rhubarb Relish

2lb. of diced rhubarb
4 large onions
1 pint of vinegar
2 cups of brown sugar
2 tablespoons of flour
1 tablespoon of curry powder
1½ teaspoons of mustard
1 tablespoon of salt

Boil the rhubarb and onions in the vinegar for 10 minutes. Add the sugar and salt, then the other ingredients mixed to a paste with a little cold vinegar. Boil for 1½ hours, then bottle and seal.

### Spiced Rhubarb

**(For serving with roast lamb)**

3lb. of rhubarb
1 teaspoon of ground cinnamon
½ cup of water
½ cup of vinegar
½ teaspoon of ground cloves
½ teaspoon of ground nutmeg
½ teaspoon of allspice
2lb. of sugar
1lb. of raisins or sultanas

Tie the spices in a bag and simmer them with the water and sugar for 20 minutes. Remove the spice bag and add the diced rhubarb and the raisins or sultanas. Boil all together for ½ hour, then bottle and seal.

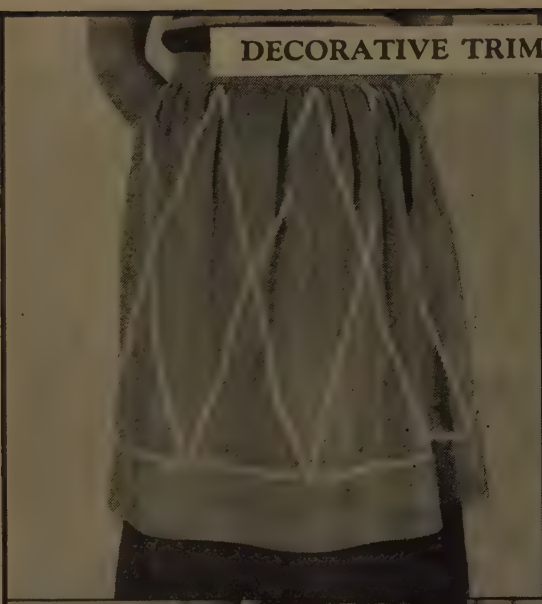
### Rhubarb Chutney

3lb. of diced rhubarb
1lb. of onions
1½lb. of apples
½lb. of sultanas
1 pint of vinegar
2½lb. of brown sugar
1 tablespoon of salt
1 tablespoon of mixed, ground spice
¼ teaspoon of cayenne pepper

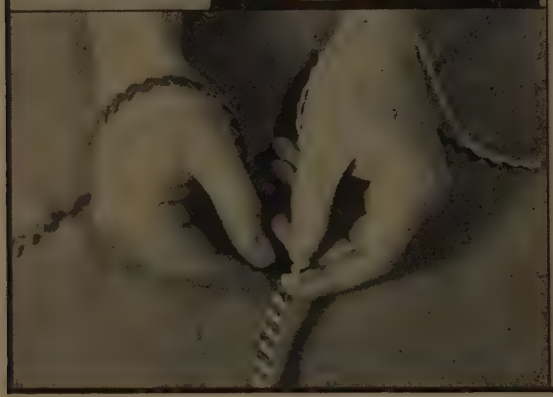
Mince the rhubarb, onions, and apples and boil all the ingredients together for 1 hour. Bottle and seal.

All photographs by Sparrow.

## DECORATIVE TRIMMINGS FOR APRONS



Upper left—Diamond pattern. Upper right—Border pattern made from graduated widths of ric-rac braid. Middle left—Border pattern of single- and double-fold bias binding and picot edging. Lower left—How two pieces of ric-rac braid of contrasting colours are plaited together. Lower right—Plaited ric-rac braid used for decoration.



# Fancy Trims to Brighten Frocks and Aprons

By EVELYN E. MOORE, Rural Sociologist, Department of Agriculture, Palmerston North

THOUGH styles and types of trimming for frocks vary from year to year as fashions change, a prettily trimmed apron is always a popular gift or finds a ready sale at a bazaar or gala day. Bias binding and decorative braids are relatively inexpensive and this article describes how they can be easily and quickly applied to aprons by machine sewing and how with a little ingenuity distinctive and original effects can be produced.

IN this article five ways of using various types of braids and bindings to decorate party aprons are shown. These can also be used on peasant skirts or they may be adapted for decorating curtains, bedspreads, or a child's frock. Hems of children's frocks which have been altered may be disguised in this way.

## Braids Must be Washable and Shrinkproof

An important precaution when buying trimmings and braids is to inquire whether they are washable and shrinkproof. Unless they are guaranteed non-shrinking and colour-fast, a small sample should be washed and tested by rubbing it on a piece of white material. If the colour comes off, avoid using it on any but dark materials, on which dye that runs is usually masked by the colour of the material. The brightly coloured braids are most likely to have colours that run. Bias binding is usually quite safe to use, but if there is any possibility that braids may shrink, they should be washed before being stitched on to the garment.

To be effective trimmings should generally be used on a plain material, though they may make an effective border for applique designs.

The designs illustrated may be adapted to most types of apron or skirt pattern. The simple pattern shown in the diagram at left below is, however, the one used in these aprons.

Follow the diagram for cutting out the apron, which is cut easily from 1yd. of 36in. material. To make up the apron edge, hem the selvedge sides of the apron skirt if desired or use the selvedge as the finished edge. Mark off and stitch the 3in. hem at the bottom of the apron skirt.

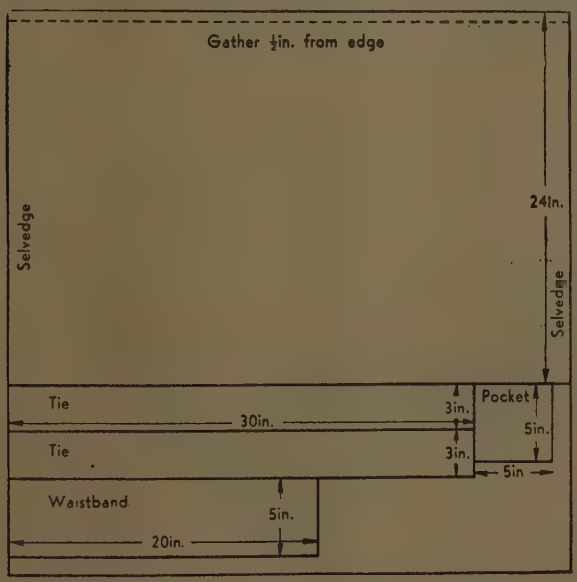
Run two rows of gathering thread along the top of the apron (see the dotted line on the diagram). Apply the desired design to the apron skirt.

Hem the apron ties, by machine if desired, along both sides and one end. Double the waist band in half lengthwise, right sides together, and insert the raw edges of the ties at each end and machine them firmly in place. Turn the band right side out, gather the top of the skirt to fit the band, and machine the front edge of the waist band to the gathered skirt, right sides together. Blind stitch the back edge of the waist band to the wrong side of the apron skirt.

If a pocket is desired, put a ½in. hem in the top, turn in the sides, and top stitch to the apron by machine in a convenient position.

## Trimmings

**1. Diamond pattern.** Draw two lines, using tailor's chalk, one 3in. above and parallel to the hemline and the other ½in. below and parallel to the top of the apron skirt. Machine a row of ric-rac braid along the bottom line. Divide each line in six equal parts (approximately 6in. sections), marking each point. Join the marks to form a series of diamonds across the skirt and stitch ric-rac or other braid over all the lines as shown in the upper left illustration opposite. Then complete the apron. This requires 8yds. of trimming.




Cutting diagram for apron from 1yd. of material.

**2. Border pattern from graduated widths of ric-rac braid.** Starting 3in. from the hemline draw 5 lines 1½in. apart. Machine a row of the widest braid on each of the outside lines, one of trimming of intermediate width on the next two inner lines, and one of narrow braid in the centre. Two rows of stitching are necessary on the wide braid. Braid colours may match or contrast. Materials required: 2yds. 6in. of each of the wider braids, 1yd. 2in. of the narrow braid. (This allows for turnings.)

**3. Border pattern from bias binding and picot edging.** This is a similar design to the preceding one, in which 2 strips of single-fold bias binding and picot edging and 2 strips of double-fold bias binding are machined 1½in. apart as shown in the middle left illustration opposite. The picot edging is inserted under the bias binding with just the picots showing before machining. It is desirable to tack these in position first. It requires 2yds. 6in. each of double- and single-fold bias binding and of edging.

**4. Plaited ric-rac braid.** In this design two contrasting colours of ric-rac braid are plaited together as shown in the lower left illustration opposite and they give the decorative touch. It is important to ensure that colour-fast braids are chosen, as the colours can run and look unattractive. Bows, as shown in the lower right illustration opposite, bands, or vertical strips of varying length can be sewn on to the apron by machine after preliminary pinning and tacking.

**5. Ric-rac braid and french knots.** This decoration, shown in the small illustration at right below, may be used as a single or double band across the bottom of the apron skirt, the lower band 3in. from the hemline and the top one 2in. higher. It is made by machining two rows of ric-rac braid, which contrast with the material, side by side so that the points touch, and by filling each centre with a french knot.

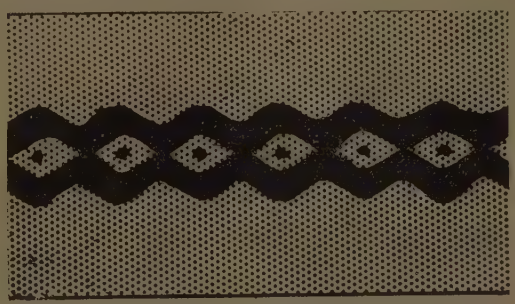


Diagram illustrating the use of ric-rac braid and french knots as a border or decoration.

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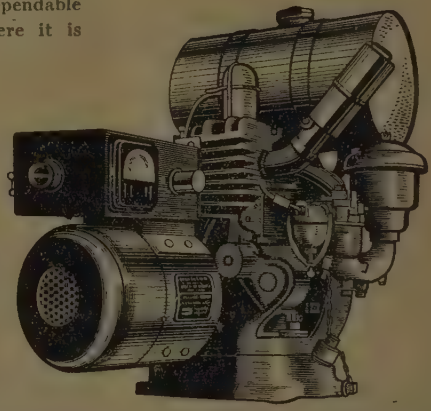

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# Rural Water Supply Amenities in South Canterbury

A GENERAL picture of the external water supply conditions—source, pressure, and storage—in country homes in South Canterbury was given last month in the first of three articles by Eirene E. Unwin, formerly Field Officer in Rural Sociology, Department of Agriculture, Christchurch, in discussing the results of a field survey which she carried out recently. This month she surveys conditions inside the homes, with details of interior plumbing and fitments, and also describes other aspects, such as precautions against frost damage and provision of water for fire fighting. In the third and final article she will discuss her rating of all the houses on a water-supply-amenities scale, and other factors connected with this.

When there are no hot taps in the washhouse much awkward dipping of hot water from the copper or carrying of buckets of hot water from the house is necessary.

FROM the housewife's point of view the interior plumbing arrangements are the factor which makes her house water supply convenient or otherwise. Storage adequate to tide over likely shortages and the provision of high pressure are after all only means to the end of supplying ample hot and cold water where it is needed inside the house. As was pointed out in the first article in this series, unless there is some device to give a continuous flow of water under pressure, it is not possible to pipe water into the house or to install a hot water system. It is, however, possible to install fixed equipment with drains, and a drainage system, all of which may be put in and used, even though water is still carried into the house. Indeed among the houses surveyed there were a few more with a drainage system than with piped water. (See Table 1.) Availability of pressure does not guarantee that it will be used either partly or fully, and there were some houses, notably in the downlands area, where the potential pressure of the supply was not used at all.

## Interior Amenities

There was a marked tendency for interior plumbing to be up to the standard of cold and hot piped water to the sink, bath, and basin, and at least cold to the tubs and copper or washing machine. The proportion of houses with all these amenities was high, above 70 per cent., and a further 15 per cent. had at least a bath, sink, and tubs with a drain and cold water at the sink; however, high as these figures were, nearly 15 per cent. of the houses had no piped water in the house, and two-thirds of these, that is, 10 per cent. of the total, had no interior plumbing or drainage fixtures.

**In fact approximately 75 per cent. only of the country houses visited had plenty of high pressure water all the year, and "all modern conveniences" such as would be found in the average town house.**

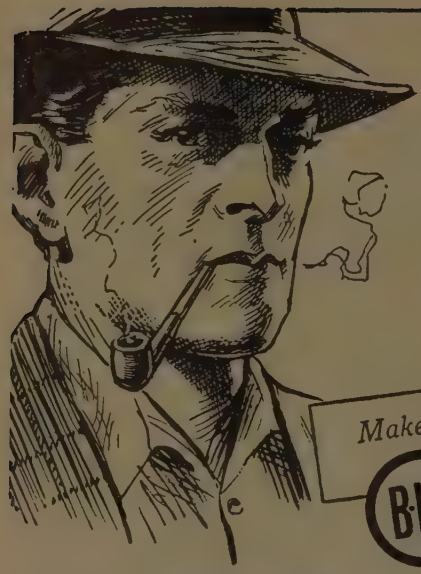
Some of this 75 per cent. still lacked certain conveniences; for example, only 35 per cent. of the total had hot water in the washhouse (discussed further later), and only 32 per cent. had a water closet. Only 23 per cent. of the families visited possessed washing machines, which were obviously considered mere luxuries by many of those who did not have them, as no doubt were dishwashers. The number of dishwashers was not ascertained exactly, but they were very few. Water closets, washing machines, and dishwashers are the refinements among water-using amenities, it is true, but the extent of labour saving service they can give, especially to the rural housewife, is incalculable. All who had them seemed to value them highly; and those who did not have them, especially the younger housewives, placed them high in their list of preferences. The older housewives, whose families were already grown up and often away from home, were more often content with what they had and looked on a washing machine particularly as extravagance. Nevertheless it is to be hoped that in time water closets and washing machines will be considered conventional necessities, just as much as a sink and bath are today.

In Table 1 the numbers of houses with various interior amenities are listed for the whole area and for the various districts. Waimate downs' having the smallest proportion of washing machines is probably at least partly explained by the fact that it is the district least well reticulated for electricity. The shortage of water closets in this area is not so easily explained, though in some cases it was due to shortage of water rather than to expense. In the hills district and on the plains the proportions for water closets were about the same as the average. In some places in the hills which had a limited rain-water supply for the house, the householder had tapped a spring or stream for the water closet and other general purposes, the spring water being too hard for use in a hot water system. It was pleasing to see that so many of those supplied with downlands water had presumably taken advantage of the ample supply to install water closets. No check was made as to whether these had been installed after the houses were supplied with the water, but undoubtedly most of them were, as most of the houses seemed to have relied on rain-water previously.

More interesting than the classification of the possession of these amenities by districts is their classification

TABLE I—NUMBERS OF HOUSES IN EACH DISTRICT WITH OR WITHOUT VARIOUS INTERIOR AMENITIES

| | Plains | Hills | Downlands | Waimate downs | Total number | Per cent. |
|---|---|---|---|---|---|---|
| Total houses | 104 | 25 | 48 | 23 | 200 | |
| Hot and cold water in kitchen and bathroom, and at least cold water in washhouse | 84 | 18 | 35 | 20 | 157 | 78.5 |
| Some only of above | 3 | 3 | 5 | 3 | 14 | 7 |
| Some fixed equipment with drains, but no piped water | 5 | 1 | 0 | 0 | 6 | 3 |
| Water closet | 33 | 7 | 21 | 3 | 64 | 32 |
| Washing machine | 26 | 5 | 12 | 4 | 47 | 23.5 |
| No interior plumbing or drainage | 12 | 2 | 8 | 1 | 23 | 11.5 |



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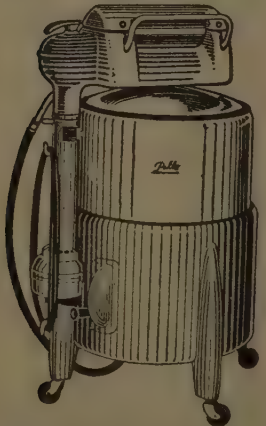

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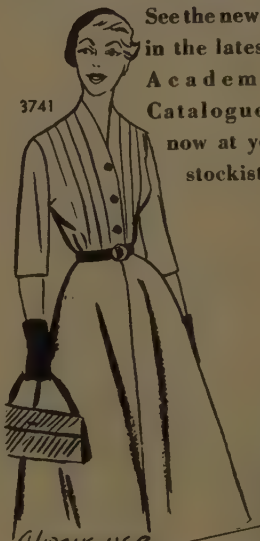

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by tenure of the holdings, as shown in Table 2. As might be expected the figures for the proportions with washing machines showed no appreciable difference between owned and rented houses, as a tenant may take a washing machine with him when he leaves the house; the capital invested yields permanent benefit to himself rather than to the landlord.

This is not so for water closets or ordinary plumbing amenities such as piping for hot and cold water and fixed equipment with drains, and the figures in Table 2 show that with such amenities there is a difference between owned and rented homes.

## Bathrooms, Laundries, and Sculleries

The houses with good interior plumbing did not lack bathrooms and laundries. However, only four-fifths of the total had bathrooms attached to the house; 8 per cent. had a bath outside with the washhouse, and just over 12 per cent. had no bathroom and consequently no fixed bath. There were 10 per cent. with no real laundry, though a few of these had a copper outside or had tubs under cover but with no fixed drainage. More than half the laundries were outhouses detached from the house, and these, beside necessitating much walking for the housewives, cause difficulty when hot water is to be piped to the tubs. Not only is a greater quantity of piping required, but pipes may have to be buried deep enough to escape damage by frost, which will involve a lot of extra work, and also a great deal of water will have to be run off every time the hot water tap is used before the water will run hot. Many fewer detached washhouses had hot water at the tubs than had laundries attached to the houses. (See Table 3.)

It was rather surprising that only 62 per cent. of the laundries attached to the houses had hot water piped to the tubs. However, the majority of housewives who had only cold taps at the tubs seemed quite content. Nevertheless the extra labour involved in carrying buckets of hot water to the tubs is considerable, and even if the water is only lifted across from the copper, it is a heavy and dangerous job, for the water is frequently nearly boiling.

Probably there is a tendency to do without a washhouse altogether in modern town homes and to replace the copper and tubs by a washing machine, usually fitted into the kitchen; if there is no washing machine, lack of a washhouse is a considerable drawback, as is the lack of a bathroom. However, any tendency to do away with a scullery should not be so regarded. By a scullery is meant a separate room in which the dishes are washed and in which, if the house has plumbing, is the sink, and such a room is of doubtful advantage in the typical servantless house of today. The sink is in constant use throughout all meal preparation, so for maximum convenience it should be not too far from the range and preparation centre or from the dining table. Nearly half the houses visited had a scullery, and nearly a quarter of these had also a separate dining room, so that the housewife must have had a great deal of walking to do between the preparation and cooking areas, the sink, and the dining table.

There was little difference in the percentages of new and old houses having sculleries, though there appeared to be a slight tendency for fewer new houses to have them. This seemed to apply also to very old houses, and is probably due to the fact that a number of very old houses were too small ever to have had a scullery, and a number of those which may have had them originally have been renovated and the separate scullery omitted.

## Washrooms

In farm houses particularly special washing accommodation for men coming in from work is a great advantage, and even non-farming families whose members might come in muddy from the garden will find that a washroom can save much work. Only 10 per cent. of the houses visited had separate basins with hot and cold water, or special washrooms, for this purpose, and a further 2½ per cent. had adequate arrangements in the laundry. In 31 per cent. of the houses there was an outside door to the bathroom, or a bathroom opening off the back porch, or there was hot water, though no basin, in the laundry. These arrangements do save the men coming through the house before they have washed and changed, but usually farm clothes and boots are left in the laundry or bathroom or on the back veranda, which hinders the housewife in keeping these places clean and tidy. A special cloakroom with basin or shower, hooks for clothes, and cupboards or shelves for boots is a much more satisfactory arrangement. A summary of the position as disclosed by the survey is given in Table 4.

A special wash place gives men the comfort of hot and cold water and a place to tidy up in without being in the housewife's way at the sink or having to go through the house to the bathroom.

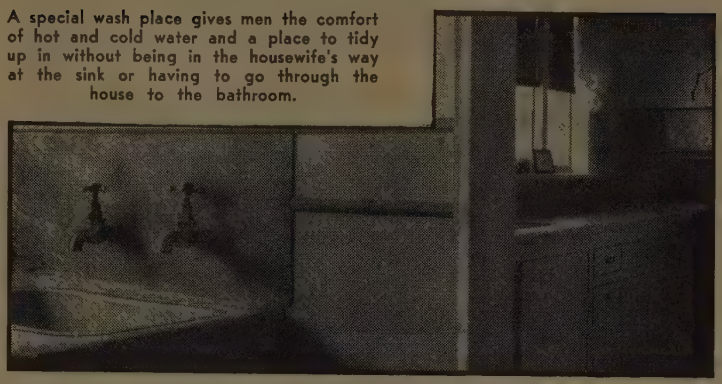

**TABLE 3—NUMBER AND PERCENTAGE OF HOUSES WITH LAUNDRIES WITH COLD AND HOT TAPS AT THE TUBS, ACCORDING TO THE POSITION OF THE LAUNDRY**

| Laundry | No. of laundries | No piped water | Cold tap | Cold only | Cold and hot |
|---|---|---|---|---|---|
| Attached .. .. | 78 | 3 | 75 ( = 96% of 78) | 27 | 48 ( = 62% of 78) |
| Detached .. .. | 102 | 15 | 87 ( = 85% of 102) | 64 | 23 ( = 22% of 102) |
| Total number | 180 | 18 | 162 | 91 | 71 |
| Percentage | (100 = 180) | 10 | 90 | 50 | 39 |

**TABLE 4—PERCENTAGE OF HOUSES WITH VARIOUS ARRANGEMENTS FOR MEN WASHING**

| | Per cent. | Per cent. |
|---|---|---|
| Washroom or special basin with hot and cold water .. .. | 10 | 13½ |
| Separate men's quarters .. | 1 | |
| Basin or shower in laundry .. | 2½ | |
| Hot water in laundry or back porch .. .. .. | 17½ | 31½ |
| Outside door to bathroom .. | 3½ | |
| Bathroom off back porch .. | 10½ | |
| Bathroom through kitchen or scullery .. .. .. | 13½ | 32½ |
| Bathroom right inside .. .. | 19 | |
| Men use laundry, but no hot water .. .. .. | 7½ | 22½ |
| Only bathroom outside house .. | 5½ | |
| Only water outside house .. | 9½ | |

In 7½ per cent. of the arrangements listed in Table 4 the housewives considered that there was no need for special washing facilities for the men in their homes.

## Hot Water Systems

By far the most common method of heating water was with a high-pressure boiler attached to a kitchen range, and nearly 60 per cent. of the houses had this as the sole method. An electrically heated cylinder alone was used in 12 per cent. of the houses, but 15 per cent. had no cylinder of any description and relied on kettles or the copper for large quantities of hot

**TABLE 2—NUMBER AND PERCENTAGE OF OWNED AND RENTED HOUSES WITH OR WITHOUT VARIOUS INTERIOR AMENITIES**

| Amenities | Owned | Percentage of total owned 100 = 161 | Rented | Percentage of total rented 100 = 39 |
|---|---|---|---|---|
| Hot and cold water in kitchen and bathroom and at least cold water in washhouse .. | 134 | 83 | 26 | 67 |
| Some fixed equipment with drains but no piped water .. .. .. .. .. | 6 | 4 | 0 | 0 |
| Water closet .. .. .. .. .. | 57 | 35 | 7 | 18 |
| Washing machine .. .. .. .. | 38 | 24 | 9 | 23 |
| No interior plumbing or drainage .. .. | 14 | 9 | 9 | 23 |

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water. In a few places an open fire was the source of heat, an appliance known as a "wet back" grate being used, and a few others relied on an incinerator. Some 10 per cent. had two methods—sometimes two sources of heat attached to the one cylinder or occasionally two separate cylinders—and a few had a small electric water heater of 2 gallons to 5 gallons capacity, usually installed above the sink, either as the only, or to supplement the main, hot water supply.

Not nearly so many electrified houses heat water with electricity as pump with it. This is probably due not so much to the expense of installing electric cylinders as to the expense of installing, as well as a certain amount of conservative dislike of, electric ranges. With a coal- or wood-burning range water heating can be obtained at no extra cost, and with modern ranges very efficiently. It is only with an electric range that a special means of heating water is necessary, and this is usually done with electricity. Nevertheless in the survey some who had coal ranges had electric cylinders. It is particularly convenient to have two sources of heat for the cylinder when there are a coal range and an electric range in the one house. In summer, when the cooler electric range is used for nearly all the cooking, the water also can be heated by electricity, and very little use of the coal range will be required. In winter, when the warmth of the coal range is an advantage, power can be saved by switching off the cylinder. As there is likely to be a power shortage every winter until the power station at Roxburgh is completed, it is better to have a cylinder heated by two methods as described than to rely solely on electricity.

It is often considered a drawback that an electric cylinder is so well insulated that it gives off very little heat and the housewife is deprived of her cylinder-warmed cupboard, which is so invaluable on a farm or where there are children, for airing and drying clothes. However, it is a more efficient use of electricity to have an insulated drying cupboard with a special element of its own which can be turned on when required than to use power for heating water and then to dissipate the heat of the water to warm the cupboard.

Among the farms visited 25 were registered dairies, and 12 of these had electric cylinders in the dairy and not in the house. This was not surprising, as ample scalding hot water is essential in a dairy and all but one of these 12 had an efficient hot water system in the house.

## Drains and Sewerage

Three-quarters of the households disposed of their waste water in a clean manner, that is, through closed drains, and a further 10 per cent. had open drains lined with concrete or some other impervious material. There were 6 per cent. with open, unlined drains and 7.5 per cent. with none.

However, once the water was drained away from the house a much smaller proportion finally disposed of it in a really satisfactory way. In 22 per cent. of cases the house drain was led into an open ditch, which on the shingly plains may be satisfactory, as the water should be able to soak away fairly quickly; but many of these drainage ditches were none the less unpleasant and unhygienic, and a breeding ground for mosquitoes and sandflies. Another 14 per cent. had drains leading into streams, which more often than not became fouled for stock drinking, and again were unpleasant and unhygienic. The waste at 7 per cent. of the houses drained away and seeped into the ground at the end of the drain pipe, which, though satisfactory in a dry summer, would undoubtedly turn the ground into an ill-smelling bog in a wet season, even on the lightest soil. Only 16 per cent. were lucky enough to be able to turn their drains on to a hillside where the water flowed away, spreading out and soaking in, and producing little effect other than a patch of permanently green grass.

**Only just over a quarter had the completely satisfactory method of dealing with their drainage water of leading it into a sump or uncemented drain pipes, where the water drains away below the surface of the ground, forming neither bog nor stagnant pool and leaving no unpleasant odour.**

Sumps are frequently used with septic tanks to drain away the effluent or liquid outflow from the tank. It is apparently not fully recognised that this effluent is still dangerous if it should get into the water supply, so the proper siting of a sump from a septic tank relative to a shallow well or bore is as important as the siting of a pit earth closet. Ordinary house drainage is not of course liable to contain harmful bacteria such as sewage may contain, but to have an open drainage ditch passing within a few yards of a well or bore across the porous soil typical of the plains hardly provides conditions of maximum purity for the water supply.

## Contamination of Supply

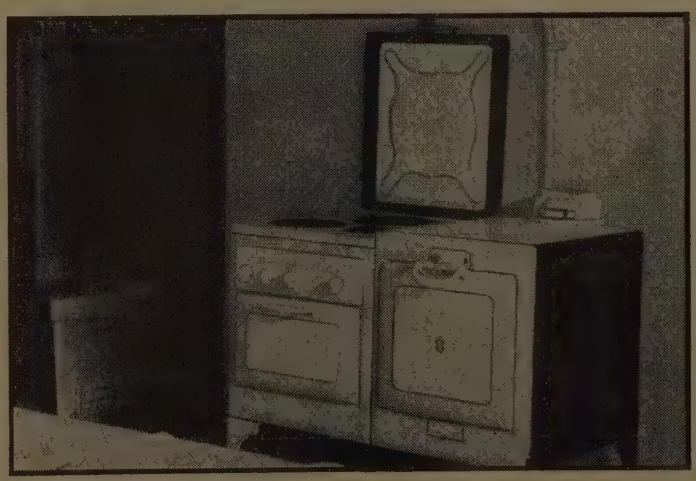
There were 18 houses visited where the purity of the water was suspect for the reason given in the preceding paragraph. Other sources of possible contamination noticed were proximity to the well or bore of the septic tank outflow (13 houses), a pit earth closet (11 houses), or a stable or cowyard (2 houses). These houses do not include any where the potential source of contamination was more than 1 chain away or downhill from the source of water. Six wells inadequately protected from surface washings or seepage were found, and at 5 houses there was an open source of water such as an unprotected spring, a stream, or a water-race. With the three last-named sources, of course, there is a particular danger of hydatids. At 10 houses the supply was unfiltered rain-water.

Though these figures are not very high, the total number of the houses with the potentially most dangerously contaminated water supply is 37, or 18.5 per cent. of the total houses visited—a figure high enough to be considered as very serious. The probable consequences to the families concerned can only be surmised, but it is unlikely that none will succumb to at least some of the minor ills commonly caused by polluted water supplies, and it is highly probable that a few major ills will result from time to time.

## Precautions against Frost

The more plumbing there is in a house the more is freezing likely to cause trouble, though even a hand pump may need some kind of insulating protection (see illustration on page 205 of the "Journal" for August 1954). Frosts in the district surveyed range from a few degrees to 20 degrees or 30 degrees on an average, so some precautions against freezing were necessary in most cases.

At 156 houses it was stated that protection against frost was necessary (see Table 5). Twenty-four used temporary insulation; bags were tied round or laid over the pipes or pump. Eighty-four used permanent insulation; the pipes were wrapped with sacking, felt, or sometimes straw. Some of



When cooking is done by electricity some source other than the kitchen range must be used for heating water. Frequently an electric cylinder is installed, but here an incinerator is used.

Irrigation channels are being increasingly used in the drier parts of South Canterbury to provide water for pasture production. Occasionally the water is used also for house supply, but the danger of contamination of the water by dogs and other animals, particularly the danger of hydatids, is obvious, and such open sources of water for a house supply are not recommended.

those who used only temporary insulation explained that anything permanent often got soaked with rain or dew which would itself freeze, doing more harm than good. But this can be avoided if the insulation is put on carefully, covered smoothly, and given several coats of paint or tar to make it waterproof. A further 16 took some extra precaution beside wrapping the pipes, such as leaving the taps running or emptying most of the pipes. Several found one or other of these methods necessary anyway, so did not bother to insulate their pipes. Emptying the pipes may be a nuisance, as once the pipes are emptied it is not usually possible to obtain any water in the house, though this depends on the system of plumbing. To leave the taps running can of course only be done if the water supply is endless.

TABLE 5—NUMBER AND PERCENTAGE OF HOUSES USING DIFFERENT PRECAUTIONS AGAINST FROSTS

| | No. | Per cent. (100 = 156) |
|---|---|---|
| Total affected | 156 | |
| Temporary insulation | 24 | 15 |
| Permanent insulation | 84 | 54 |
| Insulation plus | 16 | 10 |
| Empty pipes | 24 | 15 |
| Tap running | 5 | 3 |
| Pipes buried below frost line | 3 | 2 |
| Pipes still freeze, but rarely burst | 25 | 16 |

## Water for Fire Fighting

Very common in country houses is a serious lack of both adequate water and adequate pressure for fire fighting (see Table 6). Some have access to plenty of water, but no simple means of getting water under pressure. A few have the pressure without sufficient water to make it of any use. Many of those near the larger towns can call on the borough fire service, but this advantage of course is not typical of rural houses.

TABLE 6—NUMBER AND PERCENTAGE OF HOUSES WHICH APPEARED TO HAVE ADEQUATE WATER AND/OR PRESSURE FOR FIRE FIGHTING

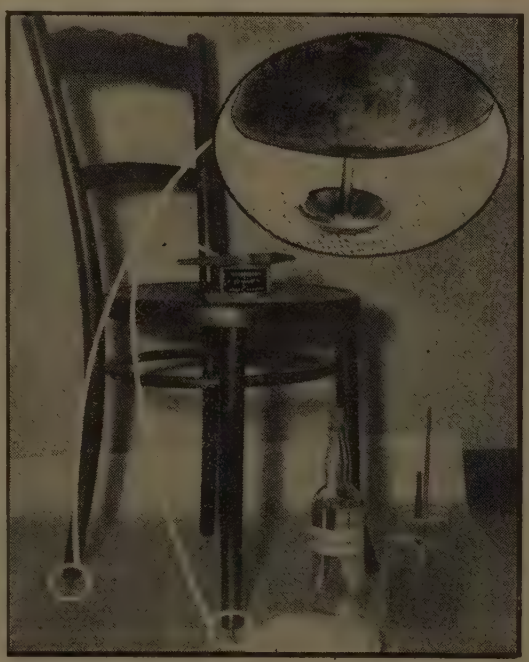
| | Adequate water under pressure | Adequate water but not pressure | Quite inadequate facilities |
|---|---|---|---|
| Number | 26 | 77 | 97 |
| Percentage | 13 | 38.5 | 48.5 |

Those depending on a high spring are in the best position, as long as they can tap the direct pressure, and those pumping water to a high reservoir holding thousands of gallons would be very unlucky if the reservoir happened to be nearly empty when a fire broke out. But the ordinary 400-gallon tank, even if placed high enough to give strong pressure, holds far too little water to be of much use against a fire, and if the water is pumped to it with electric power, there is a strong likelihood that it will not even be possible to replenish the tank because the electricity supply may be cut off by the fire. Similarly an automatic pressure pump could supply water under pressure for only as long as power was available, but as a negligible amount of water is stored in the tanks of these pumps, the owner of one is liable to be even worse off than the owner of a 400-gallon tank should the fire involve the electricity supply.

There seemed to be no provision for the people on the downlands water system to utilise the high pressure of that supply for fire fighting. Though they were in a better position than some in that they had an endless supply of water, the pressure they could obtain depended on the height of their tanks, and few had tanks high enough to give adequate fire-fighting pressure.

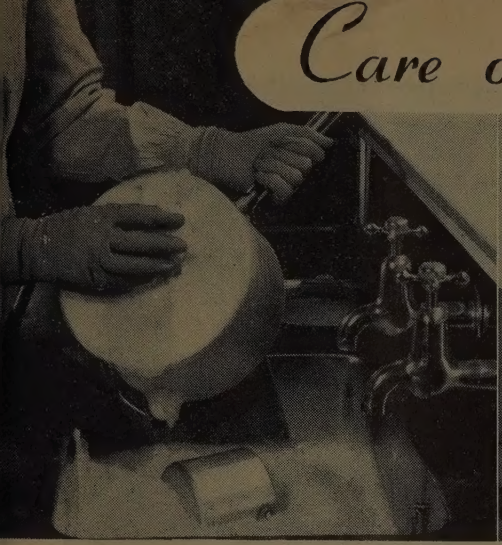
**Only a few housewives volunteered the information that they had stirrup pumps for fire fighting, and inquiries were not made about chemical extinguishers. Efficient as these may be for putting out a small blaze, and important as it is that every house in country or town should possess one or the other, and that the family should know how to use them, it remains true that in the great majority of rural houses there is no chance at all of fighting a serious fire once it gets under way.**

## Painting the Legs of Light Furniture



An easy method of lifting the legs of stools, chairs, or light tables just off the floor so that they may be painted right to the bottom is shown in the illustrations. A large tack or a drawing pin should be driven just far enough into the base of each leg to hold firm. The article should be stood down carefully on the heads of the tacks on a sheet of newspaper. It is then easy to paint all over. The tacks should not be removed until the paint is dry.—*Eirene E. Unwin, formerly Field Officer in Rural Sociology, Department of Agriculture, Christchurch.*

# Care of the Hands



DISHPAN hands evoke pity at times but never admiration, but well-tended hands and nails will contribute much to charm and beauty. Though a face may be deceptive, certain clues to a woman's character may be determined from a study of her hands. It is a fallacy to believe that only the hands of the leisured may be beautiful, as exercise, even in the form of housework or typing, will help to keep them supple and graceful. The time factor is always a problem for the busy housewife or business girl, but it is encouraging to know that once the hands and nails are restored to good condition a few minutes' daily care will keep them that way. Apart from their appearance, well-groomed hands feel so good that the time expended is really justified, and here Eleanor Couston, Field Officer in Rural Sociology, Department of Agriculture, Christchurch, describes the first treatment and later care necessary for attractive hands.

POOR health can be reflected in hands and nails in the same way as in a blotchy skin or lifeless hair. Brittle nails or those which break easily may be caused by a lack of certain minerals or vitamins in the diet. At least it is good policy to increase the intake of calcium, iron, and vitamins B and D by including extra rations of milk, cheese, eggs, liver, green vegetables and fruits, and in winter time one of the fish liver oils. Calcium and vitamin D will also help to ward off chilblains, particularly when the added precaution of avoiding overheating or chilling is observed.

Nail biting too is sometimes attributed to a dietary deficiency and causes most unsightly results. The inclusion of the above foods will remedy the deficiency, and if the hands are manicured regularly, the desire to bite the nails will disappear as pride in their appearance develops.

## Exercises

Red or purplish hands are a sign of poor circulation and simple exercises can be done in spare moments to improve this. Massage also helps and if it is carried out regularly when a hand lotion or cream is applied, it will stimulate circulation and reduce enlarged knuckles. The cream is worked in over the knuckles with the same movement as is used in easing on a pair of tight gloves, followed by brisk rubbing from the fingertips to the wrist.

Exercises to improve the circulation are:—

1. Raise the forearms until they are at right angles to the body. Let the hands fall loosely, then shake them vigorously.
2. Raise the arms above the head and clap the hands until they tingle.
3. Wring the hands.
4. Clench the fists and bend the elbows with the backs of the hands toward the body. Throw the arms forward, stretching the fingers as far and as wide as possible.

## Protection

Though exercise is good, the hands and nails require protection from too much water, from strong household cleansers, and from ingraining with dirt during gardening work or when vegetables are being prepared. Detergents for removing grease from utensils will remove the natural oil from the hands, causing them to become dry and roughened, and such a condition, particularly in cold weather, will sometimes reach a painful stage of cracking.

Protection can be given to the hands by gloves, rubber ones for wet jobs and fabric for dirty jobs. Rubber gloves can be pulled on easily if talc powder or flour is dusted over the hands.

Another method of protection is the use of barrier creams. These creams were produced during the war for workers doing tasks to which they were unaccustomed and which had severe effects on their hands. One of these creams is designed to protect the hands during wet work and another during dirty work. The cream is smoothed over the hands, rubbed well into the cuticles of the nails, and allowed to dry. This gives good protection for several hours.

The average housewife has her hands in water many times a day and should make a point of following a few rules which require little time but which will be most rewarding.

1. Avoid the habit of rinsing the hands under a running tap. The possibilities are that such water will be either too hot or too cold. Warm water is kindest to the skin.
2. Dry the hands thoroughly after each wetting and push back the nail cuticles gently with the towel.
3. Use hand lotion frequently. This helps to keep the skin soft and to prevent dryness and chapping.
4. For dishwashing use a mop or a brush with a handle to keep the hands out of water and apply this principle to other types of wet work wherever possible.
5. For fruit and vegetable preparation use a peeler instead of a knife. Besides being much quicker, it will prevent all the little cut marks which appear when peeling is done on to the thumb. When slicing always cut on to a board.

HEADING PHOTOGRAPHS: Busy hands may be beautiful. Housework and typing exercise fingers and keep hands supple.

Care and protection for hands is worth while. Left—Hardened cuticles can be restored to good condition by soaking them in warm castor oil and pressing them gently back. Above—Hands need protection from harsh cleansers and rough jobs.

## Treatment

When the hands have become really unsightly a concentrated effort will be necessary to restore them. If the nail cuticles are hard and dry, a 5 to 10 minutes' soaking in warm castor oil will soften and soothe them simultaneously. After being soaked the cuticles should be eased gently back with the end of an orange stick wrapped in cotton wool. For dry, cracked hands lanolin or hand cream should be massaged well into the skin and left on overnight to help the softening process of skin and cuticle. Roomy cotton gloves may be worn to protect the bed linen if necessary. For brittle nails a nightly painting with colourless iodine is beneficial.

Massaging with hand lotion or cream from the fingertips down helps to smooth the knuckles.

Stains on the hands from fruit or discoloration from chemicals or ink can be removed by rubbing the hands with lemon or by using a mild solution of peroxide. As the bleach will have a drying effect, an application of hand lotion or cream should follow. Nicotine stains are rather more stubborn and gentle rubbing with a soapy pumice stone is necessary.

## The Manicure

For a correct manicure old nail polish is first removed with cotton wool soaked in oily polish remover. It is not advisable to use pure acetone for this, as it has a drying effect.

For shaping the nails an emery board is preferable to a file, as it is less likely to cause injury. Almond-shaped nails are considered the ideal, so the shaping should be done to reach as near to an even oval as possible. Sharp points or talons should be avoided, as both are unattractive and unpractical.

To soften the cuticle and to take off traces of remover the fingers are then soaked in warm soapy water and, if necessary, scrubbed with a soft brush. They are then rinsed and dried thoroughly.

A little cotton wool is wrapped round the end of an orange stick, dipped in cuticle oil, cream, or cuticle remover, and worked gently round the base of the nail, the cuticle being pushed back. Cuticle should never be cut, as this tends to toughen it, but any hangnails should be clipped off. The fingertips are then washed again and dried well.

Nail varnish is then applied and allowed to dry, or the nails are polished with cake polish and a buffer. This latter method gives a more natural finish and the buffer is good for stimulating circulation. Choice of colour in nail varnish is very important and a natural colour is best for every-day use. For special occasions a brighter colour may be chosen, provided it matches the lipstick used and tones in with the general colour scheme. If varnish is used, it must never be chipped, nor should it be used as a camouflage for ill-kept nails.

The final stage is to massage hand lotion into the hands, pushing away from the fingertips down toward the wrist. A good hand lotion can be made from rose water and glycerine, but many different kinds are available.

After a little conscientious effort hands and nails will respond, and then all that is required is to remember to practise the simple routine described. Hands cannot be hidden and one cannot wear gloves all the time, so the best plan is to make them a beauty asset fit for any company.

All photographs by Oddie.

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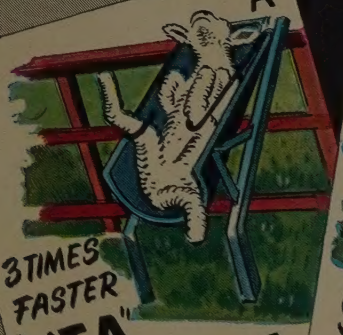

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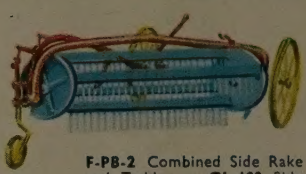

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